REPORT ON WATER QUALITY MANAGEMENT OF THE LAKE TROUT WATERS OF SOUTHEASTERN ONTARIO

October, 1977

Ontario Ministry of the Environment

Ontario Ministry of Natural Resources

REPORT

ON

WATER QUALITY MANAGEMENT

OF THE

LAKE TROUT WATERS

OF

SOUTHEASTERN ONTARIO

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SUMMARY

The Southeastern Region of the Ministry of the Environment and the Eastern Region of the Ministry of Natural Resources initiated, in 1975, a Lakes Survey Program intended to assist land use planners and resource managers in assessing the potential water quality and fisheries implications of shoreline development proposals. Of primary concern were the relatively few lakes in Southeastern Ontario which have adequate oxygen conditions to permit deep water fauna such as lake trout to survive. Elimination of the oxygen resource of these lakes is a potential implication of shoreline development.

This report summarizes the findings of water quality studies carried out during 1975 and 1976 on 52 Southeastern Ontario lakes which either currently support populations of lake trout or contain water quality conditions suitable for the survival of lake trout. Additional studies are being undertaken on these lakes by the Ministry of Natural Resources to assess factors other than water quality which have or could influence the potential of the lakes to be managed as lake trout fisheries.

The report, based on an empirical approach, groups the 52 lakes into three categories of differing sensitivities to possible oxygen depletion resulting from shoreline development. Each of the three categories of lakes are accompanied by a set of recommendations for shoreline development. The recommendations are intended to be interim in nature and will be replaced on or before December 31, 1982, with a proposed water quality and fisheries management strategy for the lakes. The management strategy proposal will serve as the basis for a public consultation program designed to permit public input into the management strategy for each lake.

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Mr. Tom Parks of Parks Air Nautical Service, Rice Lake, provided, under contract, two years of devoted and skillful piloting. Mr. Parks also contributed many hours of technical assistance for which he neither expected nor received remuneration. Special thanks is due for all of his assistance.

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Many permanent and casual employees of MOE and MNR have made valuable contributions to various components of the MOE/MNR Lakes Survey Program. The principle participants have been:

G. Whitney, MNR, technical and logistical support

D. Galloway, MOE, organization and supervision of the program

G. Owen, MOE, technical guidance

D. Aitkens, MOE, general guidance

R. Genge, MOE, field and office support

C. Bishop, MOE, typing and re-typing of the manuscript

M. German, MOE, writing of the manuscript

INTRODUCTION

In Southeastern Ontario, which for the purpose of this report is defined as including the Counties of Lennox and Addington, Frontenac, Leeds, Lanark and the Southern Portion of Hastings County, only 59 of the several hundred lakes which dot the map are currently recognized as supporting the lake trout fish species. Only 39 of these lakes are considered to be supporting populations of naturally reproducing lake trout. The remaining 20 lakes contain populations of hatchery stock lake trout. According to historical information the species formerly occurred, but no longer exists, in another 24 Southeastern Ontario lakes.

Owing to the general scarcity of lake trout waters in Southeastern Ontario; the popularity of angling for trout and the generally superior quality of these lakes in terms of water clarity; many, particularly those to the south already have a high level of shoreline development and are being subjected to both buyer and seller pressures for further development. Potential conflicts exist between continued shoreline development and the ability of resource managers to continue to maintain lake trout angling opportunities in Southeastern Ontario.

Faced with a highly prized but dwindling lake trout resource, a co-operative regional MOE/MNR Lakes Survey Program was initiated in 1975. The Program was designed to assist land

use planners and resource managers in assessing the potential water quality and fisheries implications of shoreline development proposals. The first phase of the Program involved studies by the Southeastern Region of the Ministry of the Environment designed to assess existing water quality conditions within the lake trout lakes and the potential water quality implications of further shoreline development. The second phase of the Program, being undertaken by the Eastern Region of the Ministry of Natural Resources, involves studies of the fishery to determine necessary stocking rates and permissible angling pressures. Ultimately the findings of both phases of the Program would be integrated into a single proposal outlining a water quality and fisheries management strategy for the lake trout waters.

Coincident with the initiation of the co-operative MOE/MNR Lakes Survey Program in Southeastern Ontario, the Ministry of Housing in conjunction with the Ministries of Environment and Natural Resources initiated a research project, the Lakeshore Capacity Study. Over a period of 5 to 6 years the study would carefully examine water quality, fisheries and wildlife and sociological factors in an attempt to define the appropriate assessment techniques and criteria to be utilized by resource managers in determining a lake's shoreline development capacity.

Recognizing that the results of the Lakeshore Capacity Study could modify the conclusions drawn from the regional MOE/MNR Lakes Survey Program, this report provides a preliminary assessment of the MOE survey findings and outlines a set of provisional or interim water quality management recommendations intended to ensure protection of the existing water quality conditions within the lake trout waters. For the purpose of this report, lake trout waters are being defined as lakes which either currently support lake trout populations or lakes which were discovered to have suitable water quality conditions to permit lake trout survival.

The interim recommendations are intended to serve or be in effect for a period of time not later than December 31, 1982. During this period the Ministry of Natural Resources will continue to maintain lake trout management programs and will be undertaking studies of the fishery to determine if revised management strategies are necessary. On or before December 31, 1982, MOE and MNR will produce a further report which will outline a proposed water quality and fisheries management strategy for the lake trout waters of Southeastern Ontario. The report will form the basis for a public participation program which will be designed to permit public input into the development of a final document outlining a long term water quality and fisheries management strategy for the lake trout waters of Southeastern Ontario.

It should be noted that it is not the intent of the interim guidelines to discourage shoreline development on all of the lake trout waters of Southeastern Ontario. Many of the study lakes have considerable potential for further development without jeopardizing the water quality conditions for lake trout. Others have some limited but currently undefinable shoreline development capacity and some are also recognized as having very limited potential for future lake trout management and might therefore be removed from the list of lake trout waters in the next report. It should also be noted that the Ministry of Revenue's property assessment records reveal a total of 5,118 vacant lots with frontage on lakes within the study area existed as of December, 1976. Of these, 1,830 vacant and developable shoreline lots existed on the lake trout waters included in this report.

LAKE TROUT WATER QUALITY REQUIREMENTS

Scott and Crossman [1] have provided an excellent summary of the biology of the lake trout species and Martin and Olver [2] have described the characteristics of Ontario lake trout lakes. Both of these publications are suggested for a more detailed understanding of the factors which influence the suitability of a body of water as a habitat for lake trout. In addition to water quality consideration there are other factors such as water level fluctuations, stocking rates, over harvesting and introductions of other fish species which influence the ability of a lake to sustain a lake trout fishery. This report will deal only with water quality factors.

The two most significant impacts which human activities have had on the water quality conditions in lake trout waters in Ontario are acidification and nutrient enrichment. While critical increases in the acidity have been well documented for lakes in the Sudbury vicinity, none of the lake trout waters in the Southeastern Ontario study area have, to date, shown indications of acidification. Artificial nutrient enrichment has however undoubtedly affected the water quality conditions in some and possibly all of the Southeastern Ontario lake trout waters. Regulated water levels is a

third human influence which possibly has had some impact on water quality conditions in the Southeastern Ontario lakes however the MOE/MNR Lakes Survey Program was not designed in a manner which would permit an evaluation of this potential effect. For the above mentioned reasons, this report will deal only with the potential effects of additional nutrient enrichment of the lake trout waters.

Relative to the habitat requirements of the lake trout species, a critical potential effect of nutrient enrichment is one of oxygen depletion. Since temperature is also a limiting factor for lake trout, dissolved oxygen and temperature conditions must be considered together.

Various authors suggest that lake trout can withstand water temperatures as high as 15^{o}C and oxygen levels as low as 4 mg/l, however the preferred or optimal upper temperature and lower oxygen levels are in the range of 10 to 12^{o}C and 5 to 6 mg/l respectively. As a management objective, it is suggested that a minimum depth of 10 feet of water with temperatures of 10^{o}C or less and oxygen concentrations of 5 mg/l or more should be available for the species. These criteria are utilized in this report.

While the study has not considered the water quality requirements of the other forms of aquatic life which exist

in a lake trout lake, some of these organisms are essential as food items and therefore must also be protected. Scott and Crossman [1] point out that the young lake trout prefer two forms of invertebrates, the freshwater shrimp; Pontoporeia affinis and the opposum shrimp; Mysis relicta and that the preferred food of adult lake trout is another fish species, the lake herring. The precise water quality requirements of these organisms are probably similar and possibly more stringent than those of the trout. No further mention of these fauna will be made other than to point out that the individual lake information sheets in the Appendix of the report contains a notation of whether or not the freshwater shrimp, the opposum shrimp and the lake herring have been detected from the sampling which has been undertaken on each lake.

NUTRIENT ENRICHMENT EFFECTS

In order to understand the basis or rationale utilized to arrive at the proposed interim water quality management guidelines, it is necessary to describe in general terms some of the natural processes which occur within a lake and the means by which nutrient enrichment can affect dissolved oxygen conditions.

With the exception of lakes which have regulated water levels and experience drawdown during the summer and early

fall, the temperature regime of lake trout waters is determined by natural processes. For the most part, the lakes included in this study have the 10°C temperature level established at depths of 25 to 35 feet below the surface of the lake by mid-summer. Therefore, based on the temperature requirements of the species, the top 30 feet or so of the lake trout waters in Southeastern Ontario would be unsuitable for lake trout between mid-summer and early fall.

The oxygen supply in lake trout waters normally is replenished twice a year through a natural lake process termed spring and fall turn-over. On these two occasions, the water temperature becomes uniform from surface to bottom and the entire water column is freed to turn-over or undergo mixing. This natural process permits oxygen to be uniformly distributed throughout the entire volume of the lake. This mixing process lasts only a short period of time until the lake's water column commences to develop a temperature gradient or becomes thermally stratified. During the summer stratification period, the bottom waters of a lake become isolated by means of a thermal barrier from the lake's surface waters. While the surface waters are in a state of constant mixing throughout the summer and therefore remain well aerated or supplied with oxygen, the bottom waters of the lake are limited in their ability to renew their oxygen supplies and with some exceptions to be mentioned later in the report, must rely on the initial supply of oxygen obtained during spring turn-

over to support respiration and decomposition during the summer stratification period. One of these essential functions is to supply oxygen for the respiration or breathing of lake trout and other forms of aquatic life present in the bottom waters. This function in itself would not impose a significant drain or demand on the oxygen supply. A second function, however, the decomposition of organic matter, can and in some cases does require and utilize the total oxygen supply of the bottom waters. Stratified non-lake trout lakes frequently have their total oxygen supply virtually exhausted as a result of this decomposition of organic matter. Since the organic matter being decomposed consists of plant tissue which is produced in the surface waters of the lake, it follows that the oxygen condition in the bottom waters of lake is influenced to a considerable extent by the degree of enrichment or the amount of plant tissue produced in the surface waters.

Aquatic plants, like their terrestrial counterparts, convert nutrients, carbon dioxide and sunlight into plant tissue or organic matter. The amount of organic matter produced on land or in water is frequently controlled or limited by the nutrient which is in the shortest supply. In lakes, phosphorus is the nutrient which normally is least available and therefore the nutrient which controls or determines the amount of organic matter produced in the lake's surface

waters. In lake trout lakes, most of the phosphorus supply is converted into tiny microscopic plants called algae. These plants live only for a short period of time and when they die, they settle to the bottom waters where they are decomposed at the expense of the lake's oxygen supply.

Mathematical formulas have been developed which relate annual loadings of phosphorus, lake depth and flushing rate to the lake's level of plant tissue production or more specifically to the lake's mean chlorophyll levels over the summer stratification period. Chlorophyll is a photosynthetic green pigment of plant tissue which can be accurately measured by chemical analysis as a measure of the amount of plant matter in a water sample. Dillon's [3] formula has been applied to lake trout waters included in this study and for the most part has produced a predicted chlorophyll level which matches very closely the actual chlorophyll level measured for the lake. This means that one can predict with reasonable confidence, the increase in plant matter (chlorophyll) that would be expected to occur in a lake trout lake as a result of the projected increase in phosphorus supply from any proposed increase in the level of shoreline development.

While one can predict a resulting chlorophyll level, it does not follow that one can predict from this chlorophyll level the resulting oxygen condition in a lake. Reference to

pages A48 and A14 of Appendix A will illustrate that Silver Lake with a low level of organic matter (1.2 ug/l chlorophyll) has by far a more serious level of oxygen depletion than occurs in Crow Lake with its high level of organic matter (3.1 ug/l chlorophyll). This comparision points out that other factors in addition to lake enrichment have an influence on the lake's dissolved oxygen regime. The missing component in the existing mathematical models is the ability to sort out the relationship which obviously must exist between a lake's level of enrichment and its oxygen regime. In other words, each lake must have some specific chlorophyll level, which if not exceeded, will maintain a desired level of oxygen in the lake's bottom waters. This is an essential and logical extension of Dillon's mathematical formula and it is anticipated that this predictive capability will be made available at or before the conclusion of the Lakeshore Capacity Study.

LAKE SENSITIVITIES

Based on the preceding theory and discussion, it is reasonable to state that each lake trout lake included in the study would have a specific permissible chlorophyll level which if not exceeded, would ensure that an adequate dissolved oxygen regime would be maintained to permit continued survival of lake trout. Since the ability to define this specific

chlorophyll level for each lake does not currently exist, it is not possible at the present time to define in an absolute sense, the permissible shoreline development capacity of a lake. It is possible however to examine the range of dissolved oxygen conditions detected in the study lakes and to explain these conditions based on well known lake processes. In so doing, it is also possible to identify several significant sensitivity factors which permits one to group the lakes into categories of relative sensitivities to further phosphorus inputs. The major factors which permit an explanation of the observed or measured oxygen conditions of the study lakes and have a bearing on their sensitivity or lack of sensitivity to further phosphorus supplies are considered to be the following.

Surface to Deep Water Volume Ratio

Since plant matter produced in the surface waters of a lake trout lake is for the most part decomposed in the bottom waters of the lake, it would be reasonable to hypothesize that the ratio of the waters producing plant tissue (i.e. volume of surface water) to the waters decomposing plant tissue (i.e. volume of deep water) would have a significant influence on the extent of oxygen depletion which occurs in a lake. The rationale supporting this hypothesis is provided in the following discussion and examples.

The quantity of plant matter produced as algae, in a lake, is a function of the concentration (i.e. chlorophyll level) and the volume of water in which photosynthesis is occurring. It is therefore evident that lakes with large surface areas (hence large volumes of surface waters) have the potential to produce more pounds of plant tissue than lakes with small surface areas (hence small volumes of surface waters). Considering two lakes such as Big Rideau (page A5 of Appendix A) and Knowlton (page A30 of Appendix A) which have identical chlorophyll levels (1.9 ug/l), similar depths of light penetration (32 and 34 feet respectively) but vastly different surface areas (11,614 and 450 acres respectively), it is readily apparent that more pounds of plant tissue are being produced in Big Rideau Lake than in Knowlton Lake.

Since most of the lakes commence the summer stratification period with uniform oxygen levels from surface to bottom as a result of spring turn-over, it follows that deeper lakes which have larger volumes of bottom waters would have larger oxygen reserves than shallower lakes. The deeper lakes therefore have a greater capacity to decompose organic matter and at the same time support lake trout than the shallower lakes. If another two lakes were compared which were identical in terms of chlorophyll content and features other than depth (hence volume of deep water), it would be reasonable to expect that the shallower of the two would have the most critical oxygen regime. Table 1 provides a

comparison of two lakes, Long Schooner and Round Schooner, which are similar in most respects except for their depths, volumes and dissolved oxygen profiles. It is readily evident from this example that Round Schooner Lake with its larger volume of deep water has a greater capacity to decompose organic matter and at the same time maintain suitable oxygen conditions for lake trout than the shallower Long Schooner Lake. Further information pertaining to these two lakes is provided on pages A32 and A45 of Appendix A.

TABLE 1 LONG SCHOONER LAKE vs ROUND SCHOONER LAKE

Lake trout	Present	Present
Chlorophyll	2.1 ug/l	2.1 ug/l
Surface area	494 acres	474 acres
Mean depth	23 feet	50 feet
Max. depth	65 feet	105 feet
Volume	11,381 acre-feet	23,678 acre-feet
Flushing rate	1.71 times/year	0.89 times/year
Dissolved Oxygen Conditions - September 9, 1976		
Depth		
25'	8.7 mg/l	10.5 mg/l
30'	3.6 mg/l	11.0 mg/l
35'	1.3 mg/l	9.2 mg/l
40'	0.5 mg/l	8.6 mg/l
45'	0.1 mg/l	4.2 mg/l

The preceding two lake comparisons have illustrated that the volume of surface water and volume of deep water are inter-related factors which can exert a highly significant influence on the oxygen conditions which occur in a lake and the

sensitivity of the lake's oxygen resource to depletion resulting from further phosphorus inputs. Therefore, one of the important factors used to assess the relative sensitivity of the lake trout waters can be stated as follows:

> LAKE TROUT LAKES WITH SMALL DEEP-WATER VOLUMES IN PROPORTION TO THEIR SURFACE-WATER VOLUMES HAVE A HIGHER INHERENT SENSITIVITY TO INCREASED PHOSPHORUS SUPPLIES THAN LAKE TROUT LAKES WHICH HAVE LARGE DEEP WATER VOLUMES IN PROPORTION TO THEIR SURFACE WATER VOLUMES.

Flushing Rate

A further factor which has an influence on a lake's dissolved oxygen regime is that of water exchange or flushing action. A lake's flushing rate refers to the time required for water entering the lake, assuming that it becomes totally mixed, to leave the lake as outflow. The study lakes vary significantly in terms of their estimated flushing rates from Mair Lake (see page A36 of Appendix A) with a low flushing rate of 0.08 times per year to Marble Lake (see page A37 of Appendix A) with a rapid flushing rate of 21.4 times per year. Mair Lake is a relatively deep headwater lake with no significant inflowing stream while Marble Lake is a relatively shallow lake on the Mississippi River System with a large continuous flow of water passing through it. Lakes with substantial flushing action are able to discharge

some of the organic matter which they produce and thereby lessen the demand on the oxygen supply of the deep waters. Table 2 provides a comparison of two lakes, Thirty Island and Redhorse, which vary significantly in terms of chlorophyll content, surface area and flushing rate. Without the influence of rapid flushing which occurs in Redhorse Lake, as the Gananoque River flows through it, one would expect that the amount of organic matter which it produces to severely deplete the oxygen resource of its bottom waters. Thirty Island Lake with its low flushing rate becomes severely depleted of its oxygen early in the summer. Further information pertaining to Thirty Island Lake and Redhorse Lake is provided on page B7 of Appendix B and page A43 of Appendix A.

TABLE 2	THIRTY ISLAND LAKE	REDHORSE LAKE
Lake trout	Extinct	Present
Chlorophyll	2.6 ug/l	4.0 ug/l
Surface Area	484 acres	746 acres
Mean depth	37 feet	32 feet
Max. depth	105 feet	120 feet
Volume	18,053 acre-feet	24,968 acre-feet
Flushing rate	0.34 times/year	3.84 times/year

Dissolved Oxygen Conditions

Depth	August 24, 1976	August 14, 1975
20'	10.2	7.8
30'	8.0	3.5
40'	2.0	3.4
50'	1.5	5.0
80'	0.4	5.2

Depth	September 27, 1976	October 6, 1975
20'	10.2	10.7
30'	5.1	10.2
40'	0.1	2.1
60'	0.1	4.3
80'	0.1	4.1

It will be noted in reference back to Table 2 that the flushing rate of Long Schooner Lake is higher than that of Round Schooner. The oxygen profiles of these two lakes suggest that volume of deep water has a greater influence on oxygen conditions than flushing rate. In general this appears to be the case for the study lakes. There are only a small number of the lake trout waters studied in which flushing rate appears to play a primary role in determining the oxygen conditions of the lake. These are the lakes with rapid flushing action. For the lakes of this type the following sensitivity factor can be recognized.

LAKE TROUT WATERS WITH LARGE FLUSHING RATES
HAVE A LOWER INHERENT SENSITIVITY TO INCREASED PHOSPHORUS
SUPPLIES THAN LAKE TROUT LAKES WITH LOW FLUSHING RATES.

Photosynthetic Oxygen Supply

A third factor which permits an explanation of the conditions found in some of the lakes studied is that of photosynthetic oxygen supply to the deep waters of the lake. In certain lakes, particularly those which have low chlorophyll levels, the water is sufficiently clear to permit photosynthesis to occur below the thermal barrier which separates the surface and bottom waters of the lake. Since photosynthesis or the conversion of nutrients, carbon dioxide and sunlight energy into plant tissue results in the release of oxygen, lakes in

which this activity is occurring below the thermal barrier have an additional supply of oxygen over that obtained as a result of spring turn-over. Table 3 provides evidence of this condition occurring in Knowlton Lake while absent in Kishkebus Lake. In Kishkebus Lake the depth of light penetration was determined to be 28 feet and the dissolved oxygen levels demonstrate a steady decline from surface to bottom. In Knowlton Lake, it was determined that light penetration occurred to a depth of 34 feet and it can be noted that the oxygen levels from surface to bottom demonstrate strong photosynthetic activity and maximum oxygen levels between approximately the 25 and 40 foot depths. Further information pertaining to Kishkebus and Knowlton lakes is provided on pages A29 and A30 of Appendix A.

TABLE 3 KISHKEBUS LAKE vs KNOWLTON LAKE

Lake trout	Present	Present
Chlorophyll	2.2 ug/l	1.9 ug/l
Depth of light penetration	28 feet	34 feet
Surface area	205 acres	450 acres
Mean depth	40 feet	32 feet
Max. depth	108 feet	112 feet
Volume	8,309 acre-feet	14,429 acre-feet
Flushing rate	0.87 times/year	0.20 times/year

Dissolved Oxygen Conditions

Depth	Kishkebus Aug. 14,1976	Knowlton July 11,1975	Knowlton Sept. 2,1975
10'	8.8 mg/l	9.3 mg/l	9.2 mg/l
15'	7.9 mg/l	9.4 mg/l	9.2 mg/l
20'	6.1 mg/l	10.6 mg/l	9.3 mg/l
25'	5.9 mg/l	12.7 mg/l	-
30'	6.1 mg/l	13.7 mg/l	11.8 mg/l
35'	6.1 mg/l	-	13.0 mg/l
40'	5.8 mg/l	11.9 mg/l	12.2 mg/l
50'	5.4 mg/l	-	8.5 mg/l
60'	5.0 mg/l	7.9 mg/l	-
70'	3.9 mg/l	-	7.5 mg/l
80'	2.4 mg/l	6.1 mg/l	-
100'	0.8 mg/l	4.7 mg/l	2.6 mg/l

Knowlton Lake's deep water oxygen resource appears to be partially dependent upon a continuous photosynthetic oxygen supply. A slight increase in chlorophyll levels (suspended plant matter) resulting from further phosphorus supplies could reduce the depth of light penetration and totally eliminate this source of oxygen supply below the thermal barrier. This would be expected to bring about a rapid and serious deterioration of the oxygen conditions in the deep waters of the lake. There are only a small number of lakes included in the study in which this situation appears to exist.

For these lakes, the following sensitivity factor appears to exist.

> LAKE TROUT LAKES IN WHICH PHOTOSYNTHETIC OXYGEN SUPPLIES EXIST BELOW THE THERMAL BARRIER AND ARE NECESSARY IN ORDER TO MAINTAIN SUITABLE OXYGEN CONDITIONS FOR SURVIVAL OF LAKE TROUT HAVE A HIGH SENSITIVITY TO INCREASED PHOSPHORUS SUPPLIES.

Incomplete Spring Mixing

A further factor which appears to have a significant influence on the dissolved oxygen regime of two of the study lakes is the lack of complete mixing during spring turnover. Spring mixing occurs both as a result of uniform water temperature

conditions being established throughout the water column and the physical force of wind action on the surface of the lake. In deep lakes which have very small surface areas there is insufficient energy through wind action to mix the entire volume of water. In the cases of Big Ohlmann Lake (see page A4 of Appendix A) with a surface area of only 79 acres and maximum depth of 138 feet and Mair Lake (see page A36 of Appendix A) with a surface area of 121 acres and maximum depth of 173 feet, it would appear that the physical forces which produce turnover are incapable of mixing the entire lake volume. Both lakes probably commence the summer stratification period with a portion of their bottom waters devoid of oxygen.

LAKE TROUT LAKES WHICH FAIL TO UNDERGO COMPLETE MIXING DURING SPRING TURNOVER HAVE A HIGHER SENSITIVITY TO INCREASED PHOSPHORUS SUPPLIES THAN LAKES OF SIMILAR DEPTHS WHICH EXPERIENCE COMPLETE MIXING.

While there are undoubtedly additional factors involved in determining the oxygen conditions of the deep waters of a lake trout lake, the four sensitivity factors cited above and the supply of phosphorus to each lake appear to be the major variables which account for the range of oxygen conditions present in the Southeastern Ontario lake trout

lakes. These factors must be assessed to determine the effect of further phosphorus inputs which would result from additional shoreline development.

Each of the study lakes have been examined taking into consideration the above mentioned factors. Detailed individual file reports are being prepared for each lake and have been summarized and condensed into the individual lake sheets which appear in Appendix A. Interim recommendations have been developed based on a consideration of the existing water quality conditions within each lake; an estimate of the existing total phosphorus supply to each lake and the sources of this phosphorus supply; an assessment of each lake's relative sensitivity to further phosphorus inputs and information obtained from the Ministry of Revenue concerning the number of vacant and developable lots which currently exist on each of the lakes.

The interim recommendations outlined in the following section of the report categorize the lake trout waters into three groups with decreasing sensitivities to nutrient inputs along with three accompanying sets of decreasingly stringent recommendations for shoreline development. The intent of the recommendations is to limit, where necessary, additional nutrient inputs from further shoreline development and have as a technical basis the support of soil tests conducted by the Southeastern Region on a portion of the Precambrian

Shield north of Kingston in 1974, 1975 and 1976. Additional details are available in published Southeastern Region reports (4, 5). The soil in 80 borrow pits and 17 developments was investigated. In all 255 soil tests were conducted. As a result of this program the following conclusions are made.

1) Within the area tested the soil mantle generally has a good phosphate retention capability but it is limited by the amount of soil present.

2) Present material being used for raised tile beds comes from major sand/gravel pits and is too coarse. It has a poor phosphate retention capability.

3) Suitable material is available at mor major deposit sites. Generally it is the top two to three feet of material which constitutes the A and B horizons and is characteristically light brown in colour.

The reports (see references 4 and 5) recommend,

1) that only the materials having a good phosphate retention capability be used in raised tile beds for septic tank systems on lakes judged to be sensitive to nutrient inputs;

2) that a 100 foot setback for raised tile beds be maintained on all sensitive lakes in the Southeastern Region. This recommendation is based on the average soil depth and phosphate retention capability of the native granular soils between tile beds and the lakes;

3) that Health Units and pit operators be advised of the location of suitable material and how it can be recognized.

INTERIM RECOMMENDATIONS FOR WATER QUALITY MANAGEMENT IN SOUTHEASTERN ONTARIO LAKE TROUT WATERS

Recognizing that the waters of Southeastern Ontario which have a suitable quality to sustain lake trout are a limited and non-renewable resource; that protection of this resource is a Regional Objective of the Ministry of Natural Resources and that the findings and outcome of the Province's Lakeshore Capacity Study will probably make available more definitive assessment techniques and criteria for the purpose of assessing a lake's shoreline development capacity, the following recommendations are made for the protection of water quality conditions within the Southeastern Ontario lake trout lakes. These recommendations are intended to serve on an interim basis until such time as the Lakeshore Capacity Study has been completed and a re-assessment of the shoreline development capacity of these waters can be carried out by the Southeastern Region of the Ministry of the Environment.

It should be noted that the interim recommendations are not intended to replace any existing local planning policies which are more stringent than those recommended in this report. It should also be recognized that interim recommendations will not remove the necessity for site inspections by the various authorities involved in determining the suitability for development of any specific parcel of shoreline property.

Highly Sensitive Lake Trout Waters

The lake trout waters included in this category are those which are considered to require extreme precautionary measures to prevent any further phosphorus inputs. They include the lakes which because of their physical characteristics, flushing rate and/or dependence upon a photosynthetic oxygen supply occurring below the thermal barrier and their existing supply of phosphorus, exhibit conditions critical for the continued survival of lake trout and/or which have significant committed phosphorus inputs in the form of existing vacant registered lots to bring about a condition which would be critical for the continued survival of lake trout. The lakes included in this category are as follows.

LAKE	TOWNSHIP
Ashden	Ashby
Big Ohlmann	Miller
Buck (North Basin)	Loughborough, Bedford
Buck (South Basin)	Loughborough, Storrington, Bedford
Eagle	Hinchinbrooke, Olden
Effingham	Effingham
Fortune	Miller
Grimsthorpe	Grimsthorpe
Hungry	Olden
Joe Perry	Effingham
Knowlton	Loughborough
Long Mallory	Abinger
Long Schooner	Miller
Lucky	Miller
Mackie	Miller
Mair	South Canonto
Mosque	Miller
Reid	Miller, South Canonto
Silver	Oso, South Sherbrooke
Sharbot (West Basin)	Olden, Oso
Thanet	Lake

As interim recommendations for the above mentioned lakes, the following recommendations are made.

1. No new lots with lakeshore frontage be created either by means of severance or through plan of subdivision.
2. No new tent or trailer parks or tourist establishments or enlargements of an existing tent or trailer park or tourist establishment with lakeshore frontage be permitted.
3. No further erection of multiple dwellings for rent or lease be permitted on an existing developed parcel of land with lakeshore frontage.
4. Development on existing vacant registered lots with lakeshore frontage only be permitted under the following conditions:
    i) no more than one family dwelling unit be permitted on any single vacant lot.
    ii) permits issued by the appropriate Health Unit for a private waste disposal system be made conditional upon the system being located 100 feet from the shoreline of the lake or otherwise as remote from the shoreline as the lot will permit.
    iii) where the private waste disposal system involves an underground tile bed, the fill material utilized to construct the tile bed is to be of a composition known to the Health Unit as having a suitable phosphate retention

capability. Soils reports have been prepared by the Ministry of the Environment, Southeastern Region and are available to assist the staff of the Health Units in fulfilling this requirement.

iv) the Municipality responsible for issuing the building permit for a vacant registered lot is encouraged to make the permit conditional upon the dwelling being set back as far from the shoreline as is practical taking into consideration the size, shape and topography of the lot in question. Wherever feasible, the set back should be at least 100 feet.

v) the property between the shoreline of the lake and the dwelling or private waste disposal system should be retained in its natural state to serve as a buffer to assist in minimizing the land-surface transport of nutrients to the lake.

5. The Ministry of the Environment should undertake at the earliest possible date, a shoreline inspection of all existing private waste disposal systems in order to detect and have corrected any faulty systems which could be contributing nutrients and/or bacteriological contaminants to the lake.

Moderately Sensitive Lake Trout Waters

The lake trout waters included in this category are those which are considered capable of supporting additional shoreline development provided that special precautions are taken to ensure that maximum containment of phosphorus occurs on the lot. These lakes in general have good water quality conditions for lake trout however are considered moderately susceptible to change based on one or more of the sensitivity factors outlined in the preceding section of this report. Also included in this grouping of lakes are Bobs (Green Bay), Buckshot, Draper, Mississagagon, Tangamong (Trouting Bay) and Wolfe lakes which presently are not being managed as lake trout fisheries but appear to have water quality conditions suitable to support the species. These lakes are included in this report to provide protection during the interim period and an opportunity for Natural Resources to re-assess their lake trout management potential. While it is not considered necessary to impose immediate restrictions on the number of new lots which should be permitted, the Ministry of the Environment will closely monitor the number of new lots being created over the period in which the interim recommendations are in effect and on a case by case basis may find it necessary to recommend restrictions if the trend reveals concentrated development pressure on any one of the above mentioned lakes. Except for the possible exception mentioned above, the following interim recommendations

are considered sufficient to provide an adequate margin of water quality protection. The lakes included in this category are listed below.

LAKE	TOWNSHIP
Ashby	Ashby
Birch	Bedford
Bobs (Green Bay)	Bedford
Buckshot	Miller, Abinger
Crow	Oso, Bedford
Devil	Bedford
Draper	Loughborough
King	Ashby
Kishkebus	Barrie
Mississagagon	Barrie
Otter	South Elmsley, Bastard
Round Schooner	Miller
Shabomeka	Barrie
Tangamong (Trouting Bay)	Lake
Wolfe	Bedford, North Crosby

As interim guidelines for the above mentioned lakes, the following recommendations are made.

1. The approval of any new lot with shoreline frontage either by means of severence or through plan of subdivision should be restricted to a single dwelling structure and should be conditional upon the structure and associated private waste disposal systems being not closer than 100 feet from the shoreline of the lake.
2. It is further recommended that the title for any new lot with shoreline frontage have a suitable condition inserted which would prohibit any disturbance of the natural soil mantle and provide protection against removal of the mature tree cover within 100 feet of the shoreline of the lake.

3. Any new tent or trailer park or tourist establishment or expansion of an existing tent or trailer park or tourist establishment with shoreline frontage should not be permitted within a minimum distance of 100 feet of the shoreline of the lake. An even greater set back is encouraged for this type of development.

4. Construction of more than one dwelling on any existing developed lot with shoreline frontage should be discouraged but if permitted should be conditional on the structure or private waste disposal system being not closer than 100 feet from the shoreline of the lake.

5. All new permits issued by the Health Units for private waste disposal systems which involve the construction of tile fields on lots with shoreline frontage should be conditional upon the use of a fill material known to have a good phosphorus retention capability.

6. Development on existing vacant registered lots with lakeshore frontage only be permitted under the following conditions:

    i) no more than one structure or dwelling be permitted on any single vacant lot.

    ii) permits issued by the Health Unit for a private waste disposal system be conditional upon the system being located 100 feet from the shoreline of the lake or otherwise as remote from the shoreline as the lot will permit.

iii) the Municipality responsibile for issuing the building permit for a vacant registered lot is encouraged to make the permit conditional upon the dwelling being set back as far from the shoreline as is practical taking into consideration the size, shape and topography of the lot in question. Wherever feasible, the set back should be at least 100 feet.

iv) the property between the shoreline of the lake and the dwelling or private waste disposal system should be retained in its natural state to serve as a buffer which will assist in minimizing the land-surface transport of nutrients to the lake.

Low Sensitivity Lake Trout Lakes

The lakes included in this category are those which because of their large volume of deep water and/or their rapid flushing rate are not considered to be in jeopardy of an oxygen depletion problem resulting from further shoreline development. Because of their assessed low sensitivity to minor phosphorus inputs which would result from cottage shoreline development, it is not considered necessary to impose any restrictions on further development. The lakes included in this category are named in the following list.

LAKE	TOWNSHIP
Barker	Ashby
Big Rideau	North Burgess, South Burgess, Bastard
Canoe	Bedford
Canonto	South Canonto
Charleston	Rear of Leeds & Lansdowne, Rear of Yonge & Escott
Desert	Bedford, Loughborough
Dickey	Lake
Dog (North-east Basin)	Storrington
Gould	Loughborough
Indian	South Crosby
Loughborough (West Basin)	Loughborough, Storrington
Marble	Barrie
Mazinaw	Abinger, Barrie
Palmerston	Palmerston, South Canonto
Redhorse	Rear of Leeds & Lansdowne
Wensley (Brule)	Miller

GENERAL RECOMMENDATIONS

1. All cottage owners with private waste disposal systems which would be considered substandard in terms of existing regulations are encouraged to voluntarily contact the Health Unit for assistance in determining how their system could be upgraded in the interest of water quality protection. It is particularly important for health reasons that substandard systems which may be contributing bacteria to the lake be upgraded. It is also important that cottage owners on the lakes identified in this report as being highly or moderately sensitive to nutrient inputs upgrade substandard systems in order to assist in protecting the lake trout population.
2. Cottage owners can also minimize phosphorus inputs to lakes by
    i) reducing the quantity of water utilized for domestic purposes.
    ii) avoiding the temptation to install an automatic dishwasher and/or minimizing the use of an automatic dishwasher since these conveniences require a high phosphate content detergent.
    iii) avoiding the temptation to create a cottage lawn and the use of fertilizer on an cottage lawn which might already have been created.
    iv) planting trees or shrubs to increase the amount of vegetation cover on a cottage lot.

3. While the findings of the joint MOE/MNR Lake Survey Program would undoubtedly be of interest to the property owners on the lakes studied, our files contain only a small number of contact persons, for only a few lakes. In order to facilitate effective two way communication between MOE/MNR and the property owners on Southeastern Ontario's lakes, we would encourage the property owners to form a single association for each lake and forward its name and mailing address with the two Ministries.

4. The resources of the two Ministries are limited and there are many lakes which require survey work. For this reason, the Southeastern Region of the Ministry of the Environment would encourage property owners associations to become involved in a "Self-Help" water quality monitoring program. With very little effort, the property owners associations can make a valuable contribution to the Ministry's water quality management program. Information pertaining to the "Self-Help" program can be obtained from the Ministry of the Environment, Southeastern Regional Office, 133 Dalton Sreet, Kingston, Ontario K7L 4X6.

5. On or before December 31, 1982, the Southeastern Region of the Ministry of the Environment and the Eastern Region of the Ministry of Natural Resources are to produce a follow-up report which will propose specific water quality and fisheries management strategies for each of the lake trout waters of Southeastern Ontario.

6. The report referred to in item 5 above is to constitute a discussion paper which will be utilized in a public participation program which will ensure public participation in the development of a final long-term strategy for the management of the lake trout waters of Southeastern Ontario.

REFERENCES

1. Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Bulletin 184. Fisheries Research Board of Canada.

2. Martin, N.V. and C.H. Olver. 1976. The Distribution and Characteristics of Ontario Lake Trout Lakes. Ontario Ministry of Natural Resources.

3. Dillon, P.J. 1974. A Manual For Calculating the Capacity of a Lake For Development. Ontario Ministry of the Environment.

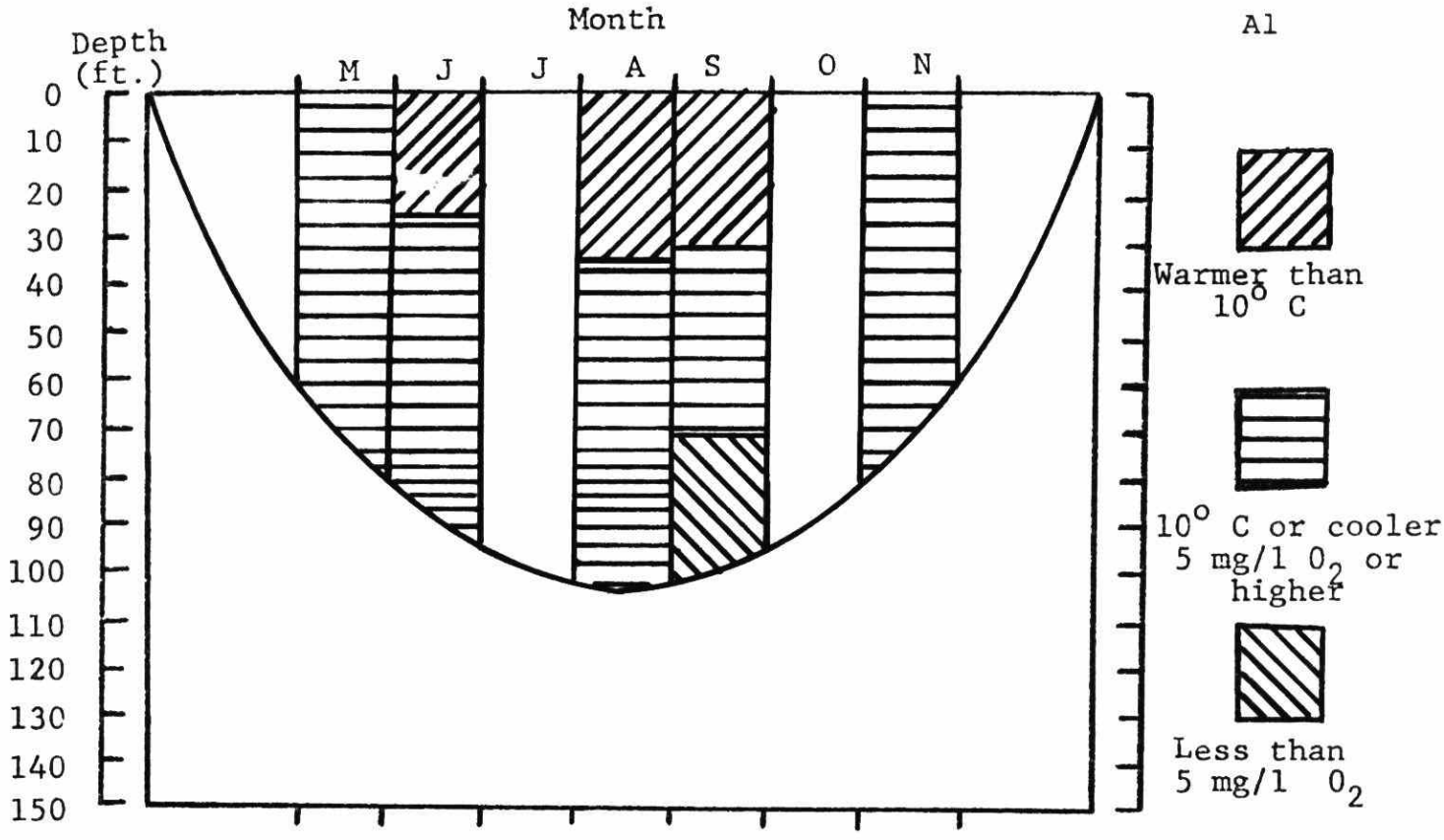
4. Aitkens, D.F. 1975. Phosphorus Retention Capability of Granular Soils on a Portion of the Precambrian Shield. Ontario Ministry of the Environment.

5. Ontario Ministry of the Environment. 1977. Phosphorus Retention Capability of Granular Soils on the Precambrian Shield North of Kingston.

APPENDIX A

Appendix A provides in alphabetical order individual data summary sheets for each of the lake trout waters studied. In many cases, more than one sampling site was studied on a lake. The summary sheets provide data for only the deepest sampling station on each lake and therefore probably illustrates the best water quality conditions for each body of water. The dissolved oxygen and temperature profiles illustrated on each summary sheet show depth but not area or volume to scale. Unless otherwise noted on the summary sheets, the chlorophyll and Secchi disc data provided are seasonal averages from ice-out to freeze-up and based on 12 to 14 samples.

In order to facilitate location of individual summary sheets, the lakes are listed below along with a corresponding page number where the sheet can be found.



ASHBY LAKE

Morphometry Hydrology

Surface Area	640	acres
Mean Depth	38	feet
Maximum Depth	120	feet
Volume	25,218	acre-feet
Watershed Area	14.2	sq. miles
Flushing Rate	0.42	times/yr.
Water Level Fluct.	1.2	feet

Shoreline Development

Cottages, Homes	84
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	66
% Shoreline Patent	34

Estimated Phosphorus Supply (Annual)

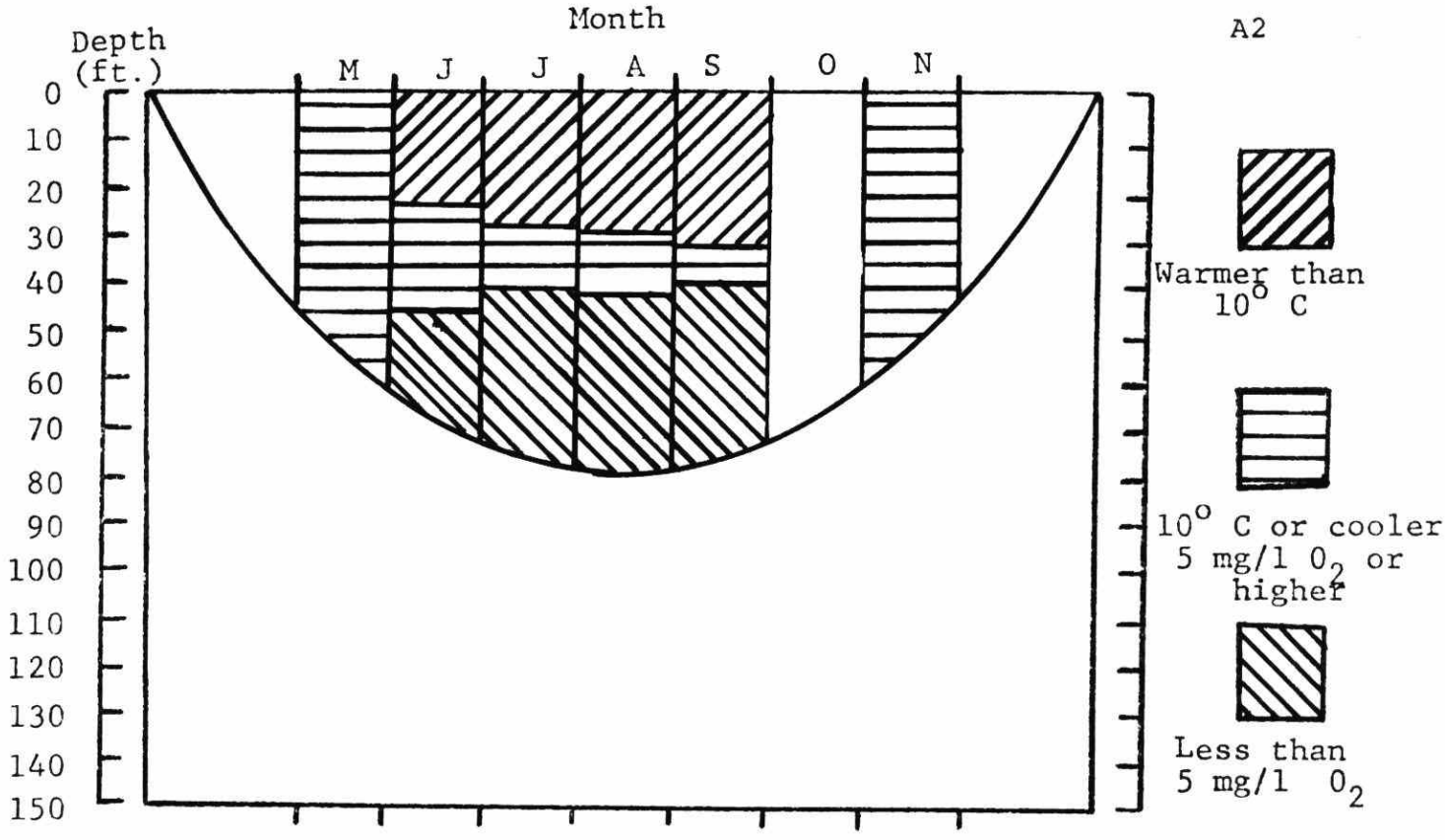
Upstream Lakes	182 lbs.	23%
Land Runoff	83	10
Atmosphere	429	53
Shoreline Develop.	114	14

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
21	1.2	5	12	34	5	293	0.10	6.6

Ashby Lake supports a population of native and naturally reproducing lake trout. The shoreline supports 84 developed lots. The 1976 survey of Ashby Lake revealed a low level of enrichment at 1.2 ug/l chlorophyll. The oxygen profiles demonstrate good water quality conditions for lake trout. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further oxygen depletion resulting from additional shoreline development.



ASHDEN LAKE

Morphometry Hydrology

Surface Area	341	acres
Mean Depth	32	feet
Maximum Depth	82	feet
Volume	11,073	acre-feet
Watershed Area	4.7	square miles
Flushing Rate	0.30	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	9
Vacant Lots	9
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	60
% Shoreline Patent	40

Estimated Phosphorus Supply (Annual)

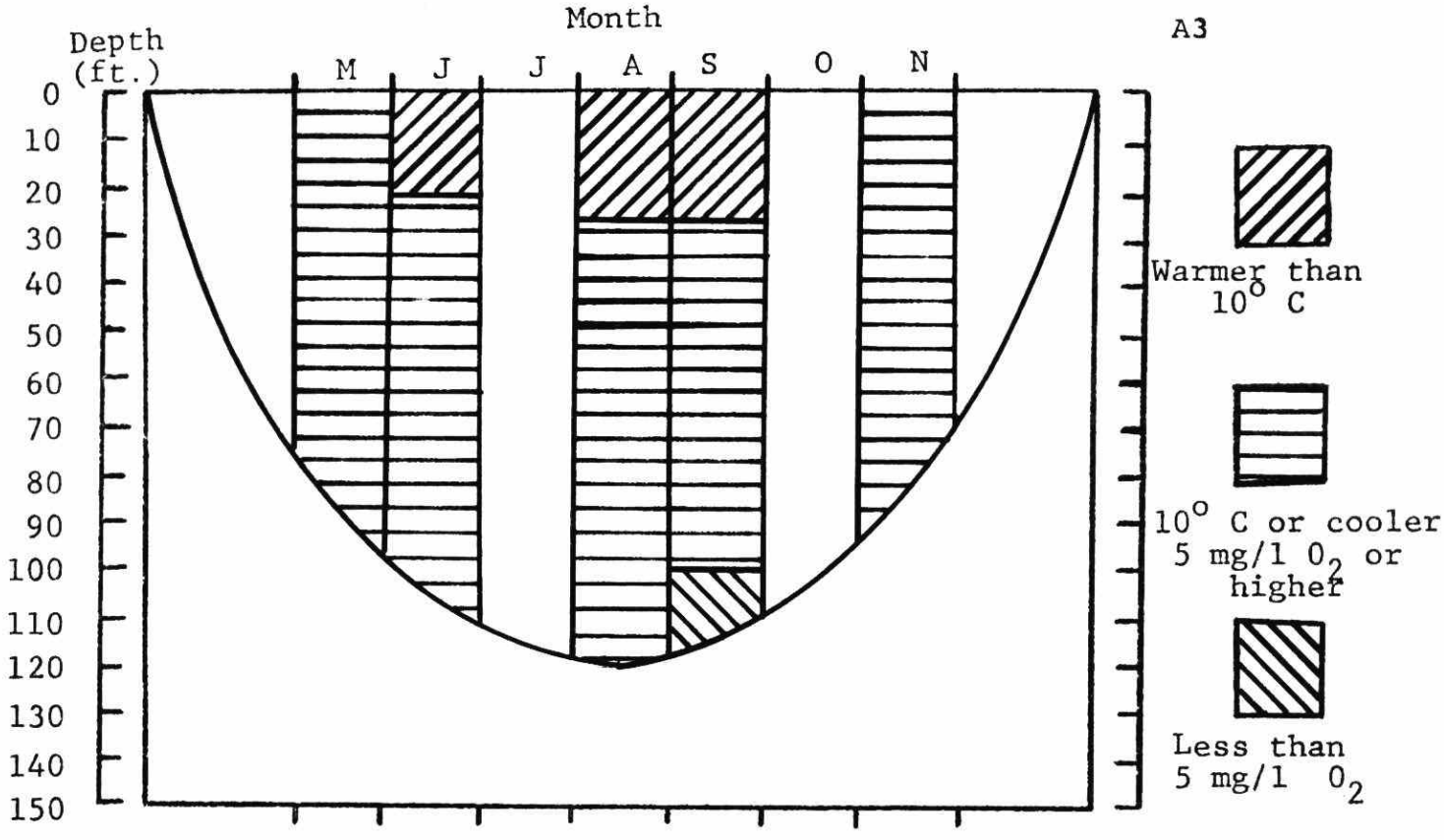
Upstream Lakes	0 lbs.	0%
Land Runoff	132	35
Atmosphere	228	61
Shoreline Develop.	12	4

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
22	1.8	5	92	120	12	390	0.10	8.0

Ashden Lake supports a population of native and hatchery stock lake trout. The shoreline of the lake is approximately 40 percent in private ownership and has only 9 developed and 9 vacant lots. The 1976 survey revealed a moderate level of enrichment at 1.8 ug/l chlorophyll. The oxygen profiles indicate a fairly confined zone with the lake trout's preferred oxygen and temperature conditions. The lake is considered to be highly sensitive to further phosphorus inputs owing to its small deep water volume.



BARKER LAKE

Morphometry Hydrology

Surface Area	427	acres
Mean Depth	42	feet
Maximum Depth	125	feet
Volume	18,028	acre - feet
Watershed Area	8.2	square miles
Flushing Rate	0.33	times per year
Water Level Fluct.	1.3	feet

Shoreline Developpment

Cottages, Homes	4
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	99
% Shoreline Patent	1

Estimated Phosphorus Supply (Annual)

Upstream Lakes	0 lbs.	0%
Land Runoff	421	59
Atmosphere	286	40
Shoreline Develop.	5	1

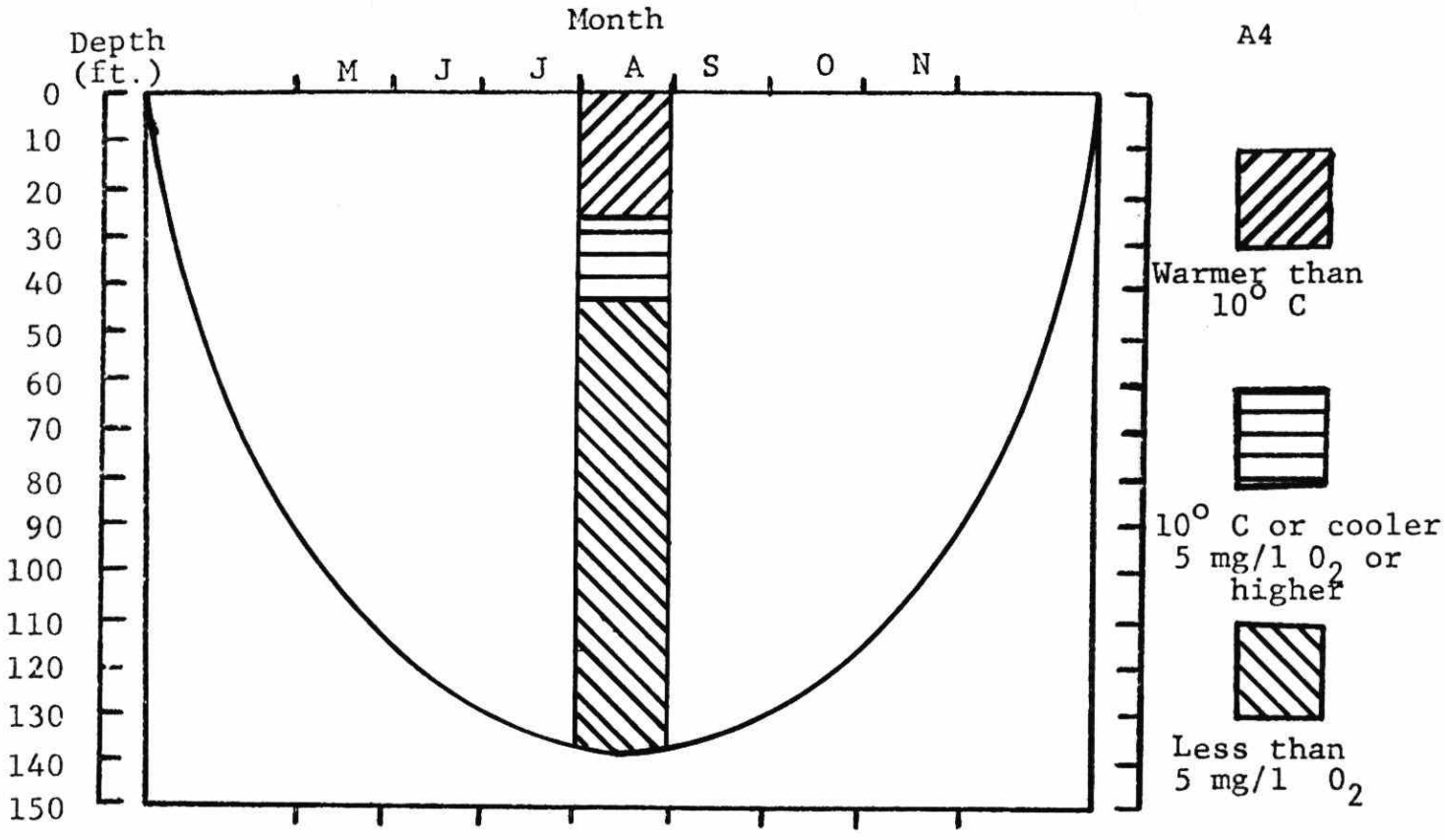
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
19	1.4	8	11	43	7	302	L 0.05	6.9

L = less than

Barker Lake supports a population of native and naturally reproducing lake trout. There is practically no existing shoreline development. The 1976 survey of Barker Lake revealed a low level of enrichment at 1.4 ug/l chlorophyll. The oxygen profiles demonstrate excellent water quality conditions for lake trout. Based on the lake's large volume of deep water, its oyygen resource is considered to be insensitive to depletion from further shoreline development.



BIG OHLMANN LAKE

Morphometry Hydrology

Surface Area	79	acres
Mean Depth	67	feet
Maximum Depth	138	feet
Volume	5,309	acre-feet
Watershed Area	0.7	square miles
Flushing Rate	0.11	times per year
Water Level Fluct.	2.0	feet

Shoreline Development

Cottages, Homes	1
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	71
% Shoreline Patent	29

Estimated Phosphorus Supply (Annual)

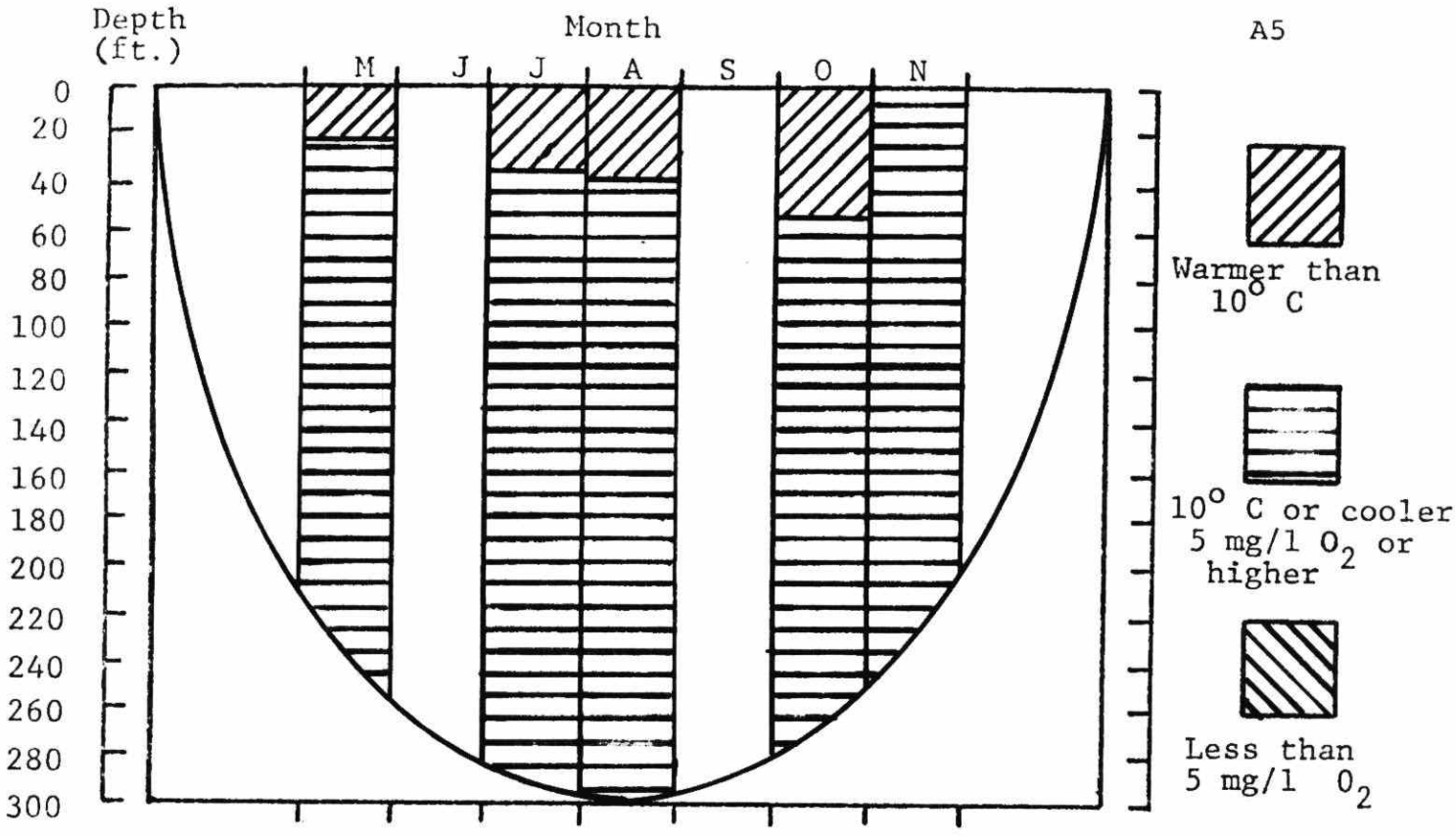
Upstream Lakes	0	lbs.	0%
Land Runoff	19		26
Atmosphere	53		73
Shoreline Develop.	1		1

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
28		5	42	66	26	580	0.15	7.8

Big Ohlmann Lake supports a native and naturally reproducing population of lake trout. The shoreline of the lake is undeveloped and is in approximately 40 percent private ownership. Owing to the lake's small surface area, it could not be sampled by aircarft and only one visit to the lake was made in 1976. The August oxygen profile indicates suitable water quality for lake trout however the oxygen reserve had been severely depleted considering the large volume of deep water relative to surface area. It appears likely that the small surface area precludes complete mixing in spring and fall. Until additional sampling of the lake is possible, it would appear advisable to prevent further nutrient inputs.



BIG RIDEAU LAKE

Morphometry Hydrology

Surface Area	11,614	acres
Mean Depth		feet
Maximum Depth	312	feet
Volume		acre-feet
Watershed Area	184.9	square miles
Flushing Rate		times per yr.
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	1,063
Vacant Lots	347
Tourist Camps	49
Tent, Trailer Sites	353
% Shoreline Crown	5
% Shoreline Patent	95

Estimated Phosphorus Supply (Annual)

Upstream Lakes	2,255 lbs.	13%
Land Runoff	5,262	30
Atmosphere	7,776	44
Shoreline Develop.	2,297	13

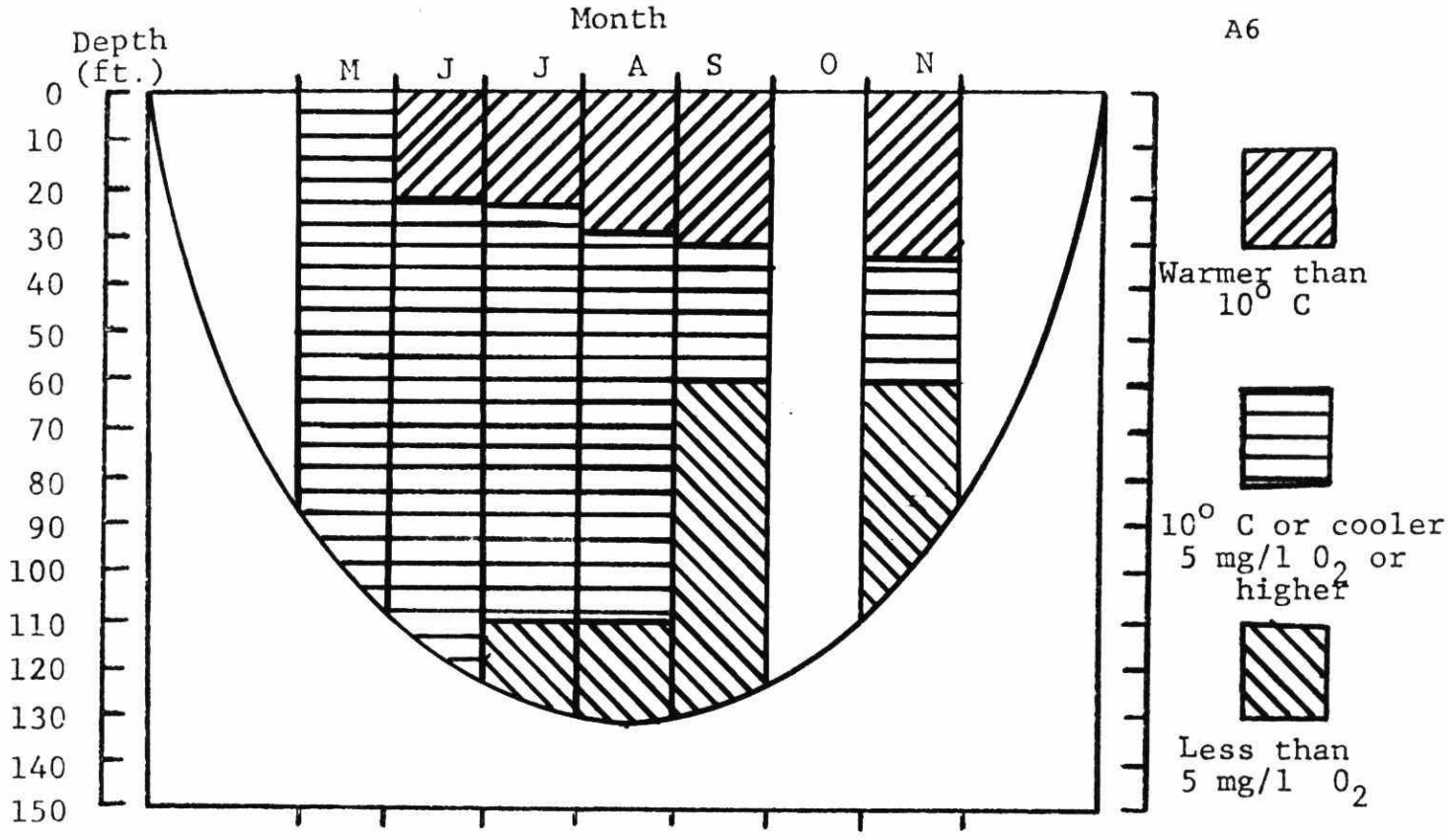
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
16	1.9	5	95	137	15	345	L 0.05	8.1

L = less than

Big Rideau Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake supports a high level of existing and committed development. The 1975 survey of Big Rideau Lake revealed moderate level of enrichment at 1.9 ug/l chlorophyll. The oxygen profiles demonstrate excellent water quality conditions for lake trout. Based on the lake's large volume of deep water, its oxygen resource is considered to be insensitive to depletion resulting from further shoreline development.



BIRCH LAKE

Morphometry Hydrology

Surface Area	484	acres
Mean Depth	43	feet
Maximum Depth	131	feet
Volume	20,995	acre-feet
Watershed Area	48.3	square miles
Flushing Rate	1.7	times per year
Water Level Fluct.	4.7	feet

Shoreline Development

Cottages, Homes	8
Vacant Lots	4
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	77
% Shoreline Patent	23

Estimated Phosphorus Supply (Annual)

Upstream Lakes	1,407 lbs.	73%
Land Runoff	192	10
Atmosphere	320	16
Shoreline Develop.	13	1

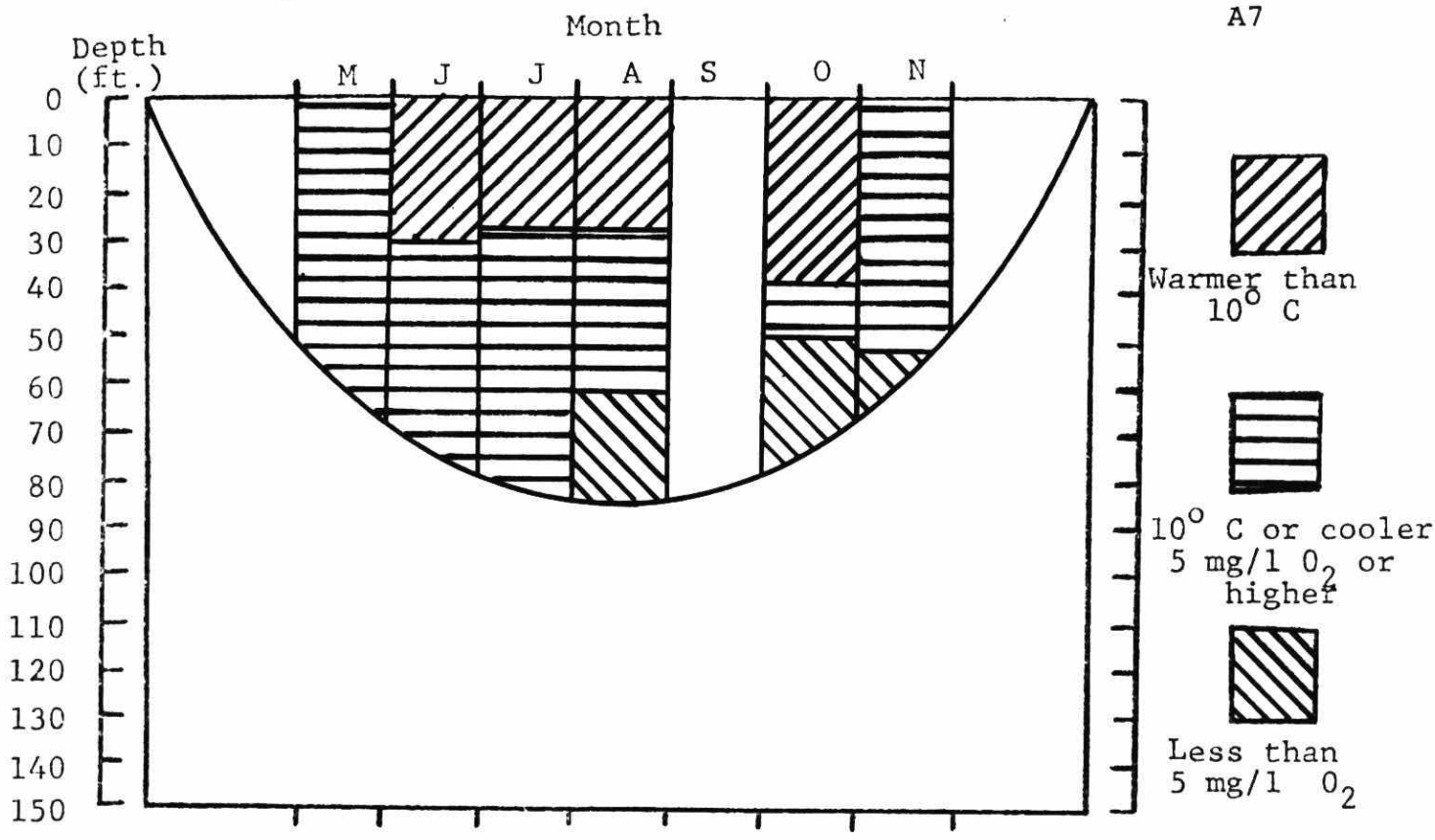
Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	present
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18	2.4	5	70	106	12	337	L 0.05	8.3

L = less than

Birch Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is only sparsely developed. The 1975 survey of Birch Lake revealed a moderately high level of enrichment at 2.4 ug/l chlorophyll. The oxygen profiles indicate good water quality condition for lake trout. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further oxygen depletion resulting from additional shoreline development.



BOB'S LAKE - GREEN BAY

Morphometry Hydrology

Surface Area	1,320	acres
Mean Depth		feet
Maximum Depth	85	feet
Volume		acre - feet
Watershed Area	8.5	square miles
Flushing Rate		times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	106
Vacant Lots	
Tourist Camps	34
Tent, Trailer Sites	20
% Shoreline Crown	10
% Shoreline Patent	90

Estimated Phosphorus Supply (Annual)

Upstream Lakes	0	lbs.	0%
Land Runoff	355		25
Atmosphere	884		63
Shoreline Develop.	161		12

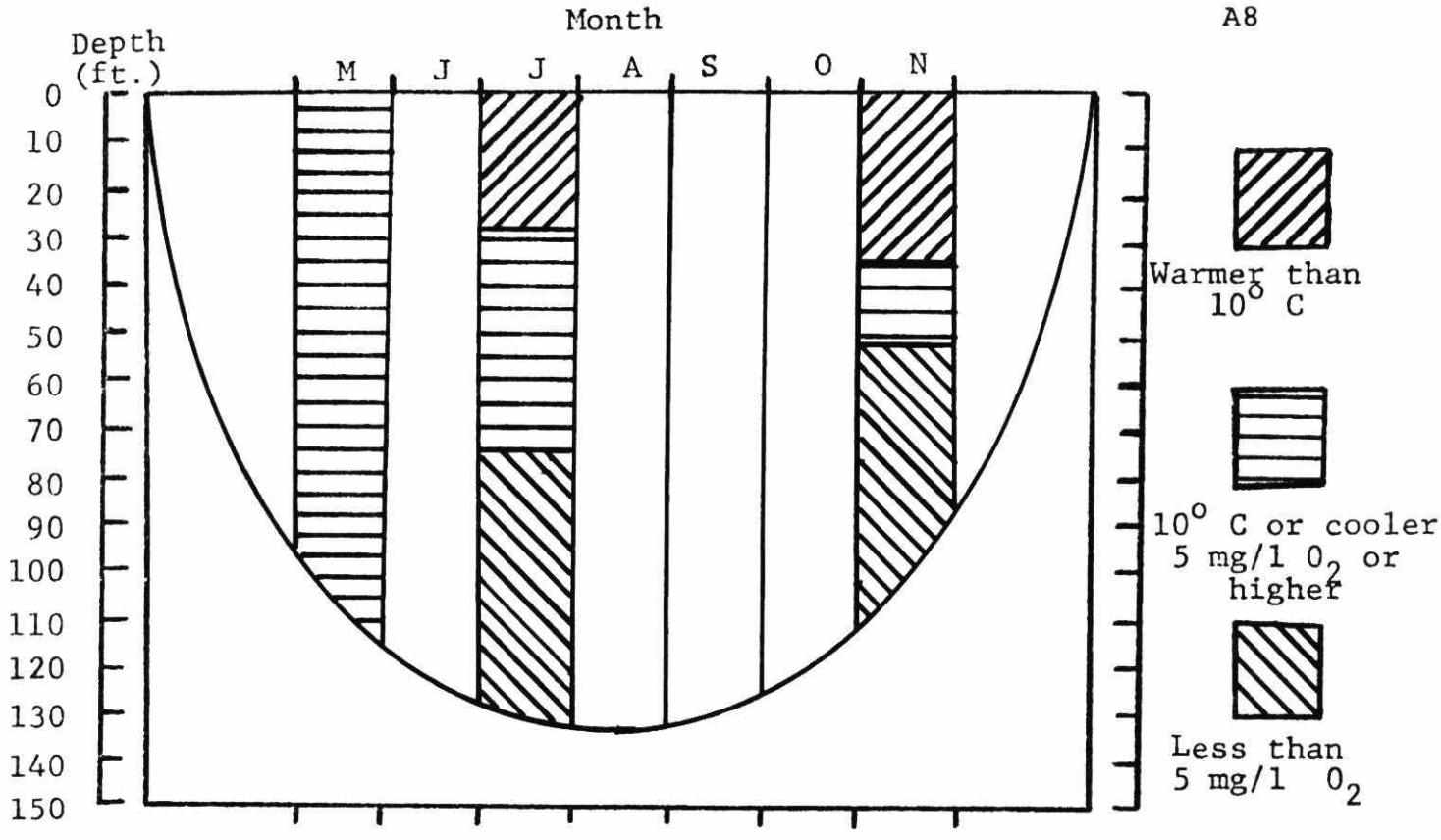
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18	2.4	L 5	82	123	15	452	L 0.05	8.1

L = less than

Bob's Lake (Green Bay) is considered for fisheries management purposes to have an extinct lake trout population. The shoreline of the bay has a relatively low level of development. The 1975 survey revealed a moderately high level of enrichment at 2.4 ug/l chlorophyll. The oxygen profiles for Green Bay show reasonably good water quality conditions for lake trout and possibly some potential to re-activate a lake trout fishery. The bay has a relatively small volume of deep water and therefore a moderately high sensitivity to further oxygen depletion.



BUCK LAKE - SOUTH BASIN

Morphometry Hydrology

Surface Area	1,198	acres
Mean Depth		feet
Maximum Depth	134	feet
Volume		acre-feet
Watershed Area	13.3	square miles
Flushing Rate		times per year
Water Level Fluct.	3.5	feet

Shoreline Development

Cottages, Homes	181
Vacant Lots	110
Tourist Camps	4
Tent, Trailer Sites	0
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

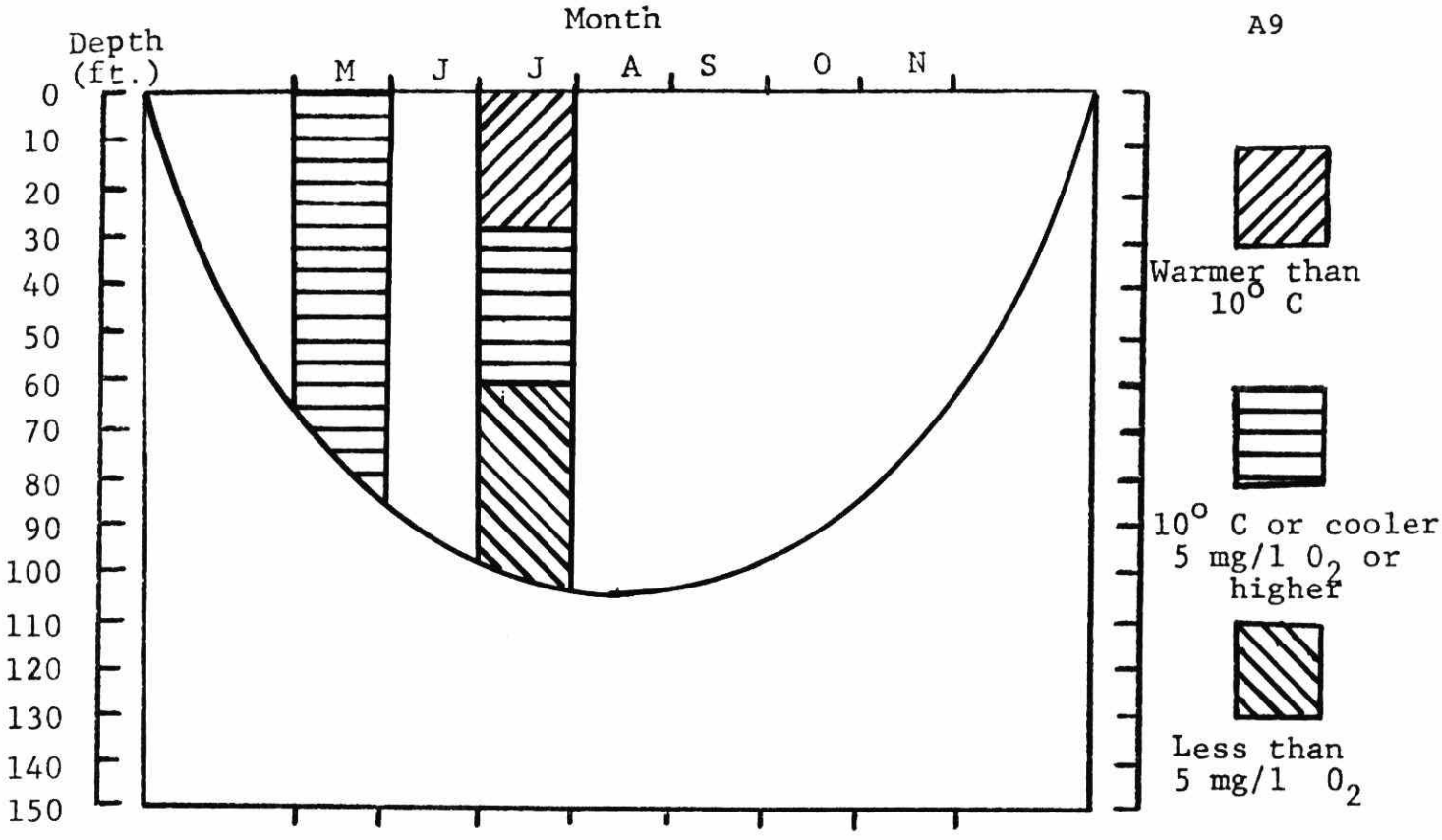
Upstream Lakes	53 lbs.	3%
Land Runoff	822	43
Atmosphere	802	42
Shoreline Develop.	247	12

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Akalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	1.9	5	71	110	13	392	0.35	7.6

Buck Lake (South Basin) supports a population of native and naturally reproducing lake trout. The shoreline is entirely in private ownership and supports 181 developed lots. A further 110 vacant lots exist. The 1975 survey revealed a moderate level of enrichment at 1.9 ug/l chlorophyll. The oxygen profiles indicate suitable water quality conditions for lake trout. While the basin is relatively deep and should therefore be only moderately sensitive to further phosphorus inputs, the supply of phosphorus which will result from development of the 110 vacant lots should for the interim period be considered the maximum desirable increase.



BUCK LAKE - NORTH BASIN

Morphometry Hydrology

Surface Area	683	acres
Mean Depth		feet
Maximum Depth	105	feet
Volume		acre-feet
Watershed Area	3.2	square miles
Flushing Rate		time per year
Water Level Fluct.	3.5	feet

Shoreline Development

Cottages, Homes	77
Vacant Lots	49
Tourist Camps	0
Tent, Trailer Sites	25
% Shoreline Crown	10
% Shoreline Patent	90

Estimated Phosphorus Supply (Annual)

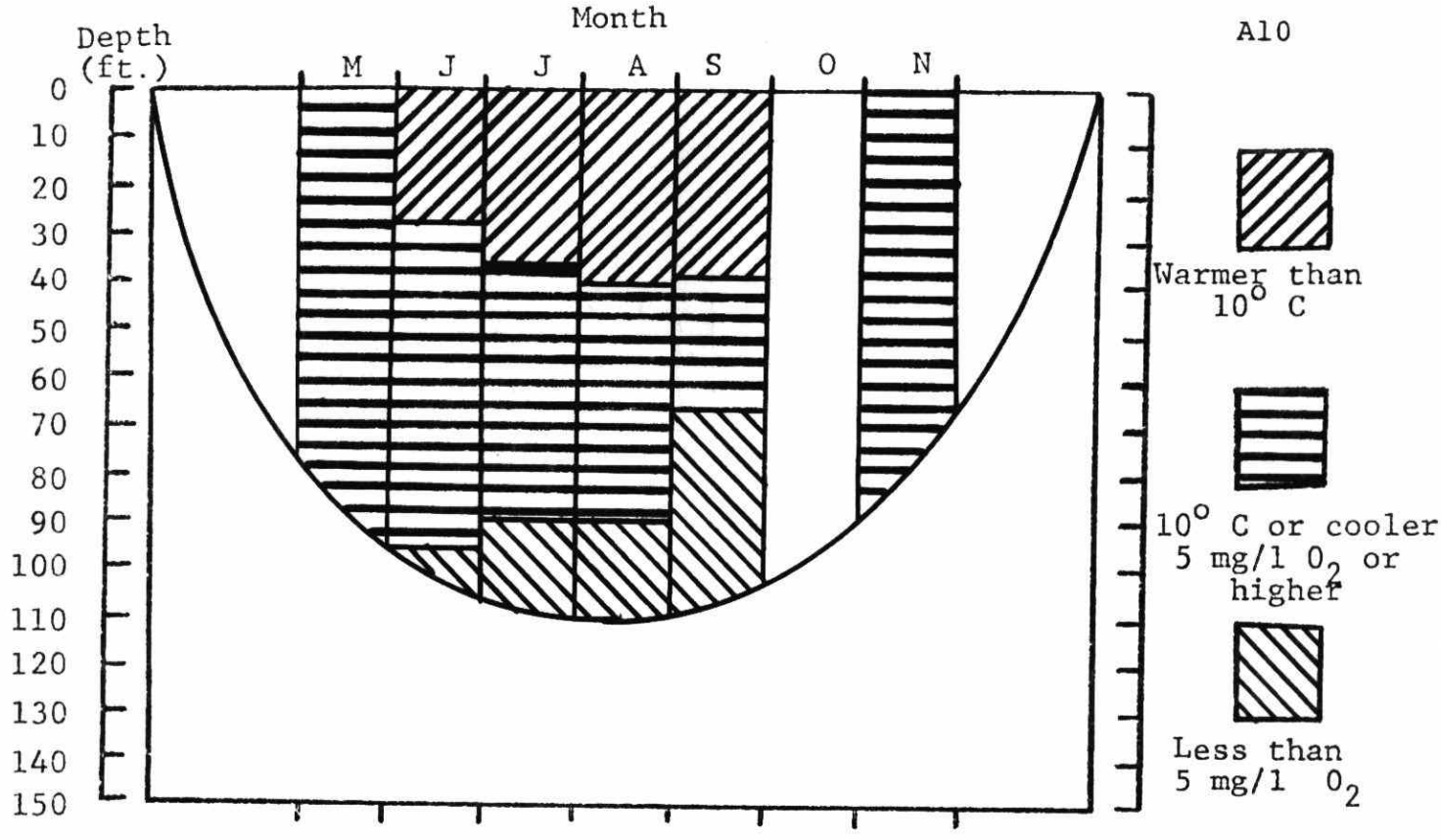
Upstream Lakes	66	lbs.	9%
Land Runoff	121		16
Atmosphere	456		59
Shoreline Develop.	130		16

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	present
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
14	2.6	7	43	69	15	343	0.27	7.7

Buck Lake (North Basin) supports a population of native and naturally reproducing lake trout. Approximately 90 percent of the shoreline is in private ownership. In addition to the 77 developed lots, a further 49 vacant lots exist. The 1975 survey revealed a moderately high level of enrichment with 2.6 ug/l of chlorophyll. Sampling for dissolved oxygen was carried out only during May and July. While the July conditions were suitable for lake trout, previous surveys have revealed late summer depletion of the oxygen reserve. The basin has a relatively small deep water volume and is considered sensitive to further phosphorus inputs. Supplies in addition to that which will occur from development of the 49 vacant lots should be prevented.



BUCKSHOT LAKE

Morphometry Hydrology

Surface Area	1,085	acres
Mean Depth	32	feet
Maximum Depth	110	feet
Volume	34,677	acre - feet
Watershed Area	29.9	square miles
Flushing Rate	0.64	times per yr.
Water Level Fluct.	2.0	feet

Shoreline Development

Cottages, Homes	111
Vacant Lots	2
Tourist Camps	14
Tent, Trailer Sites	0
% Shoreline Crown	25
% Shoreline Patent	72

Estimated Phosphorus Supply (Annual)

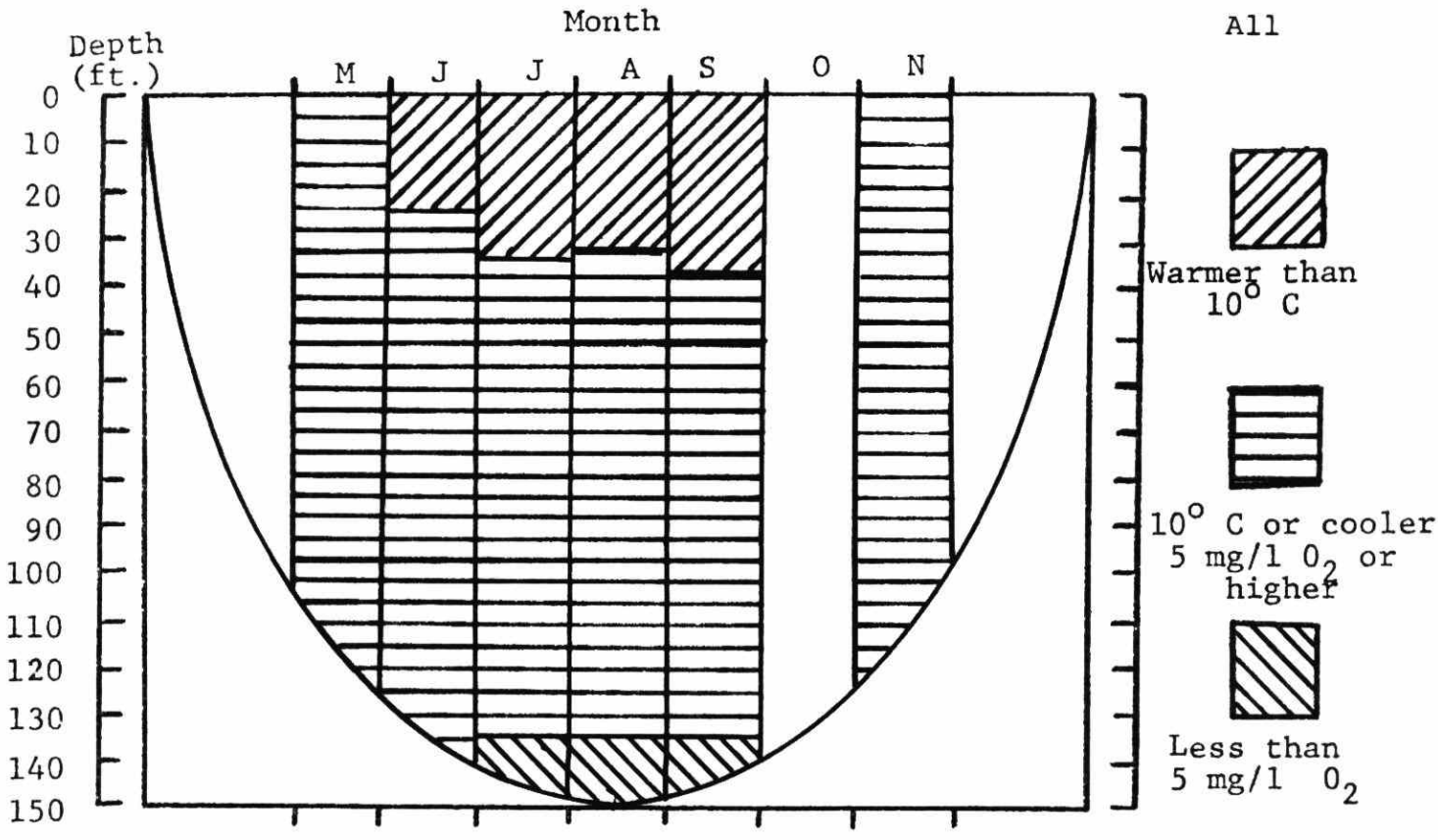
Upstream Lakes	75 lbs.	4%
Land Runoff	713	42
Atmosphere	726	43
Shoreline Develop.	170	11

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18	1.3	8	27	53	8	329	0.10	7.0

Buckshot Lake for purpose of fisheries management is currently considered to have an extinct lake trout population. The shoreline of the lake supports a moderate level of development. The 1976 survey of Buckshot Lake revealed a low level of enrichment at 1.3 ug/l chlorophyll. The oxygen profiles demonstrate good water quality conditions for lake trout and potential to re-activate a lake trout fishery. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further oxygen depletion resulting from additional shoreline development.



CANOE LAKE

Morphometry Hydrology

Surface Area	719	acres
Mean Depth	75	feet
Maximum Depth	154	feet
Volume	54,067	acre-feet
Watershed Area	9.5	square miles
Flushing Rate	0.12	times per year
Water Level Fluct.	8.0	feet

Shoreline Development

Cottages, Homes	25
Vacant Lots	22
Tourist Camps	3
Tent, Trailer Sites	60
% Shoreline Crown	23
% Shoreline Patent	77

Estimated Phosphorus Supply (Annual)

Upstream Lakes	64	lbs.	8%
Land Runoff	148		19
Atmosphere	483		62
Shoreline Develop.	90		11

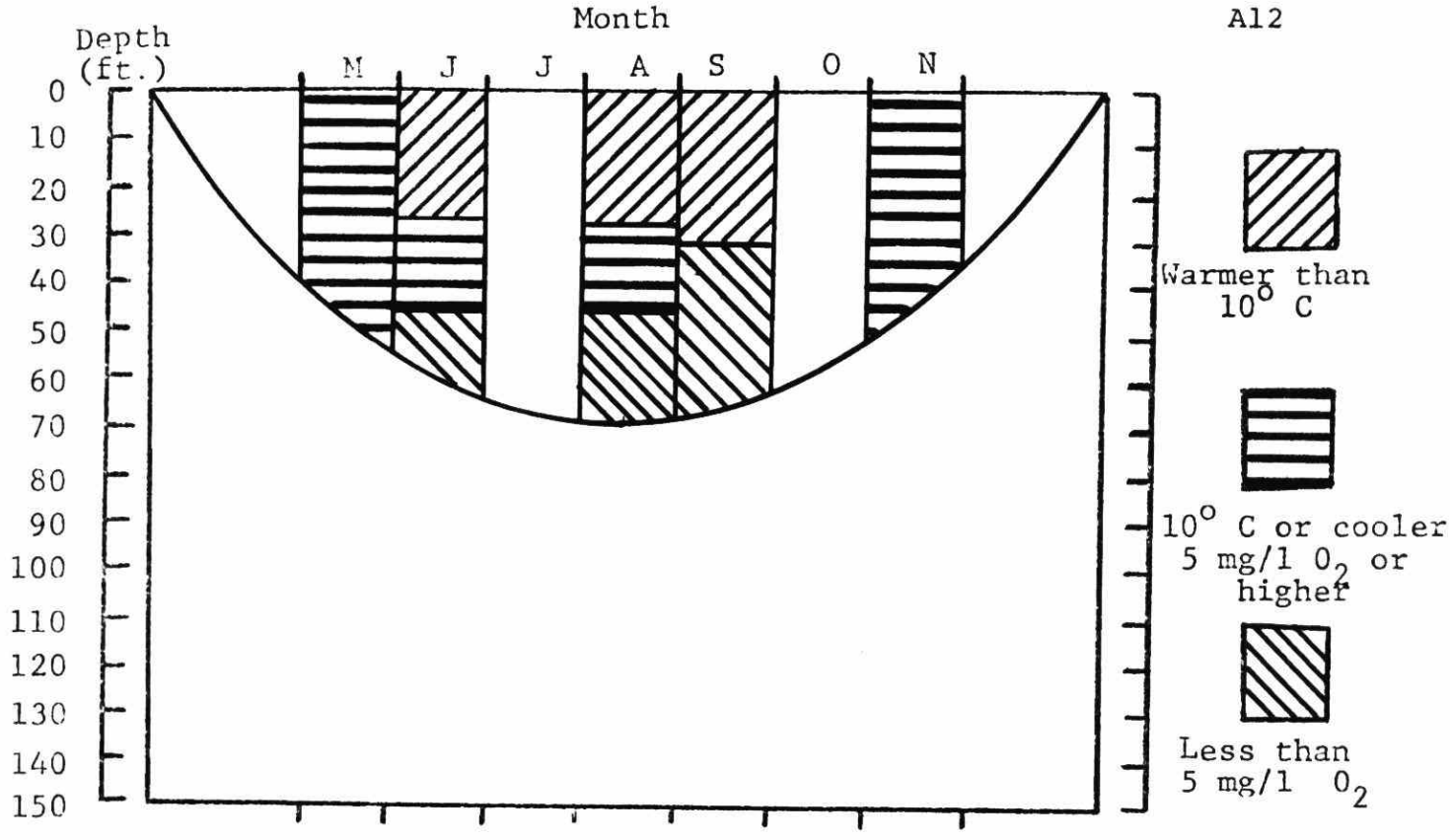
Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
27	1.8	5	80	111	11	285	L 0.05	8.1

L = less than

Canoe Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is only sparsely developed. The 1975 survey of Canoe Lake revealed a moderate level of enrichment at 1.8 ug/l chlorophyll. The oxygen profiles demonstrate excellent water quality conditions for lake trout. Based on the lake's large volume of deep water, its oxygen resource is considered to be relatively insensitive to depletion resulting from further shoreline development.



CANONTO LAKE

Morphometry Hydrology

Surface Area	546	acres
Mean Depth	12	feet
Maximum Depth	70	feet
Volume	6,882	acre - feet
Watershed Area	22.6	square miles
Flushing Rate	2.43	times per year
Water Level Fluct.	13.0	feet

Shoreline Development

Cottages, Homes	31
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	1
% Shoreline Patent	99

Estimated Phosphorus Supply (Annual)

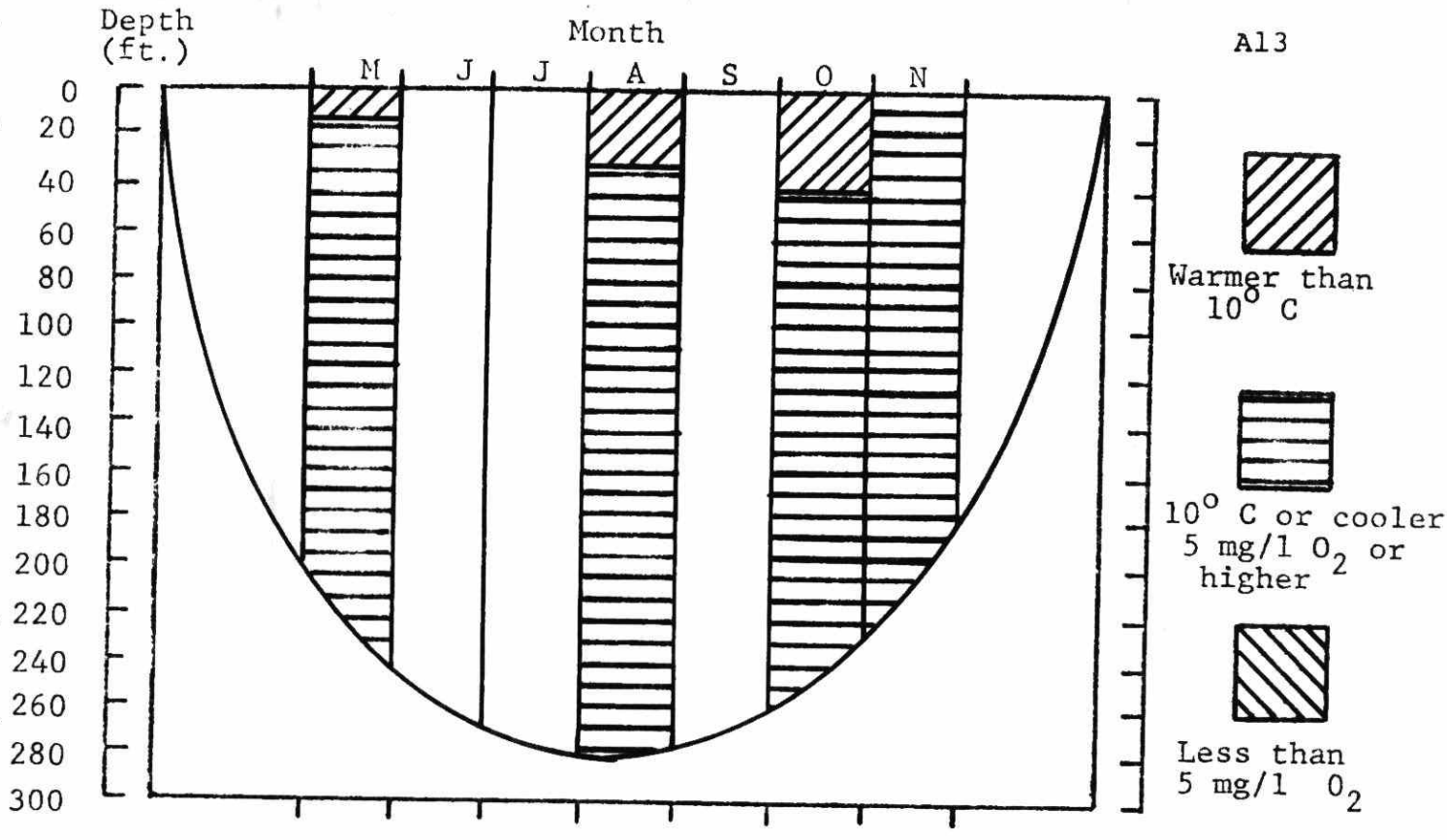
Upstream Lakes	285	lbs.	32%
Land Runoff	210		23
Atmosphere	365		40
Shoreline Develop.	42		5

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18	3.4	5	92	125	21	473	0.20	7.8

Canonto Lake is considered for fisheries management purposes to have an extinct lake trout population. The shoreline of the lake is only sparsely developed. The 1976 survey of Canonto Lake revealed a high level of enrichment at 3.4 ug/l chlorophyll. The oxygen profiles indicate poor water quality conditions for lake trout. The lake has only a very small volume of deep water however owing to the lake's rapid flushing action, its oxygen resource is considered to be relatively insensitive to depletion resulting from further shoreline development.



CHARLESTON LAKE

Morphometry Hydrology

Surface Area	6,220	acres
Mean Depth	57	feet
Maximum Depth	285	feet
Volume	354,298	acre-feet
Watershed Area		square miles
Flushing Rate		times per yr.
Water Level Fluct.	2.0	feet

Shoreline Development

Cottages, Homes	690
Vacant Lots	221
Tourist Camps	26
Tent, Trailer Sites	0
% Shoreline Crown	20
% Shoreline Patent	80

Estimated Phosphorus Supply (Annual)

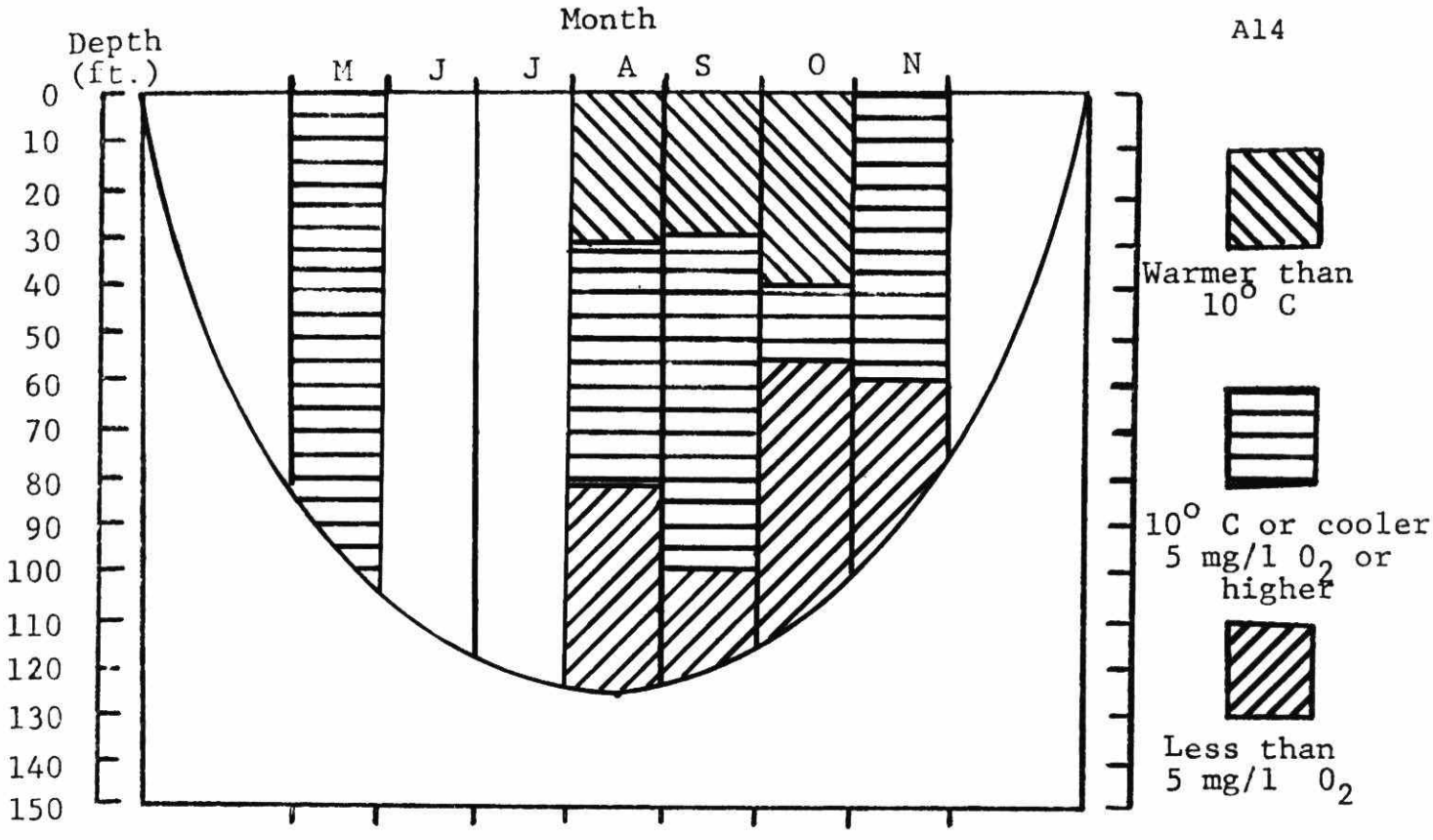
Upstream Lakes	744	lbs.	28%
Land Runoff	708		27
Atmosphere	856		32
Shoreline Develop.	330		12

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	present
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
15	3.0	5	93	142	22	427	0.93	7.5

Charleston Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is highly developed or committed for development. The 1975 survey of Charletson Lake revealed a high level of enrichment at 3.0 ug/l chlorophyll. The oxygen profiles reveal excellent water quality conditions for lake trout. Based on the lake's large volume of deep water, its oxygen resource is considered to be relatively insensitive to depletion resulting from further shoreline development.



CROW LAKE

Morphyometry Hydrology

Surface Area	1,077	acres
Mean Depth	48	feet
Maximum Depth	125	feet
Volume	57,376	acre - feet
Watershed Area	18.9	square miles
Flushing Rate	0.27	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	89
Vacant Lots	23
Tourist Camps	39
Tent, Trailer Sites	14
% Shoreline Crown	5
% Shoreline Patent	95

Estimated Phosphorus Supply (Annual)

Upstream Lakes	0 lbs.	0%
Land Runoff	966	50
Atmosphere	734	38
Shoreline Develop.	218	12

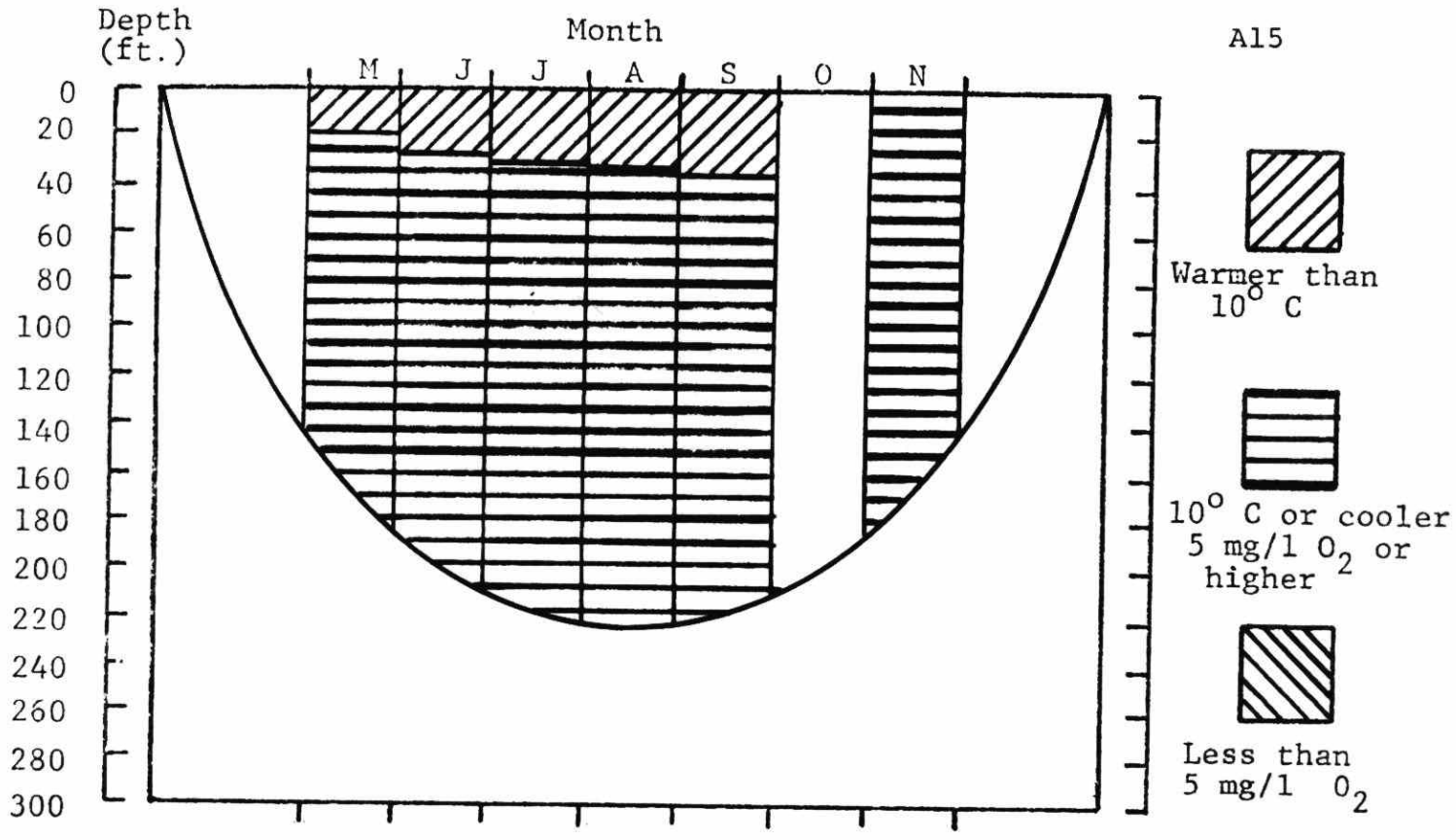
Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
19	3.1	7	60	90	21	342	L 0.05	8.2

L = less than

Crow Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake supports a low to moderate level of development. The 1975 survey of Crow Lake revealed a high level of enrichment at 3.1 ug/l chlorophyll. The oxygen profiles indicate depletion but suitable water quality conditions for lake trout. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further oxygen depletion resulting from additional shoreline development.



DESERT LAKE

Morphometry Hydrology

Surface Area	944	acres
Mean Depth	73	feet
Maximum Depth	223	feet
Volume	69,306	acre - feet
Watershed Area	37.5	square miles
Flushing Rate	0.40	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	71
Vacant Lots	18
Tourist Camps	20
Tent, Trailer Sites	75
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

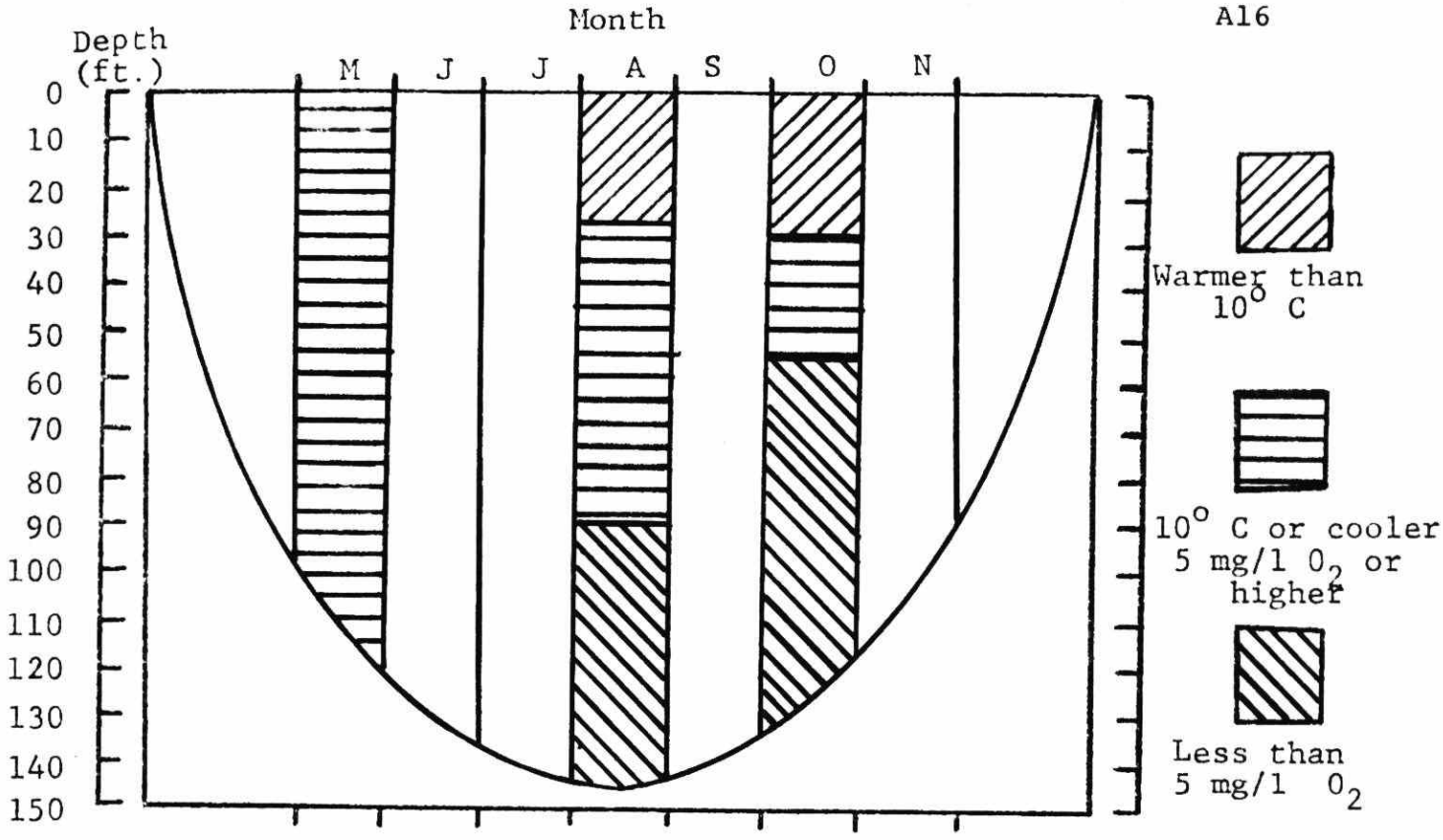
Upstream Lakes	877	lbs.	44%
Land Runoff	243		12
Atmosphere	633		32
Shoreline Develop.	238		12

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	present
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
19	2.6	5	76	112	18	339	0.27	7.9

Desert Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake supports a low to moderate level of development. The 1975 survey of Desert Lake revealed a moderate to high level of enrichment at 2.6 ug/l chlorophyll. The oxygen profiles demonstrate excellent water quality conditions for lake trout. Based on the lake's large volume of deep water, its oxygen resource is considered to be insensitive to depletion resulting from further shoreline development.



DEVIL LAKE

Morphometry Hydrology

Surface Area	2622	acres
Mean Depth	47	feet
Maximum Depth	154	feet
Volume	123,503	acre - feet
Watershed Area	67.2	square miles
Flushing Rate	0.40	times per year
Water Level Fluct.	3.0	feet

Shoreline Development

Cottage, Homes	220
Vacant Lots	63
Tourist Camps	17
Tent, Trailer Sites	34
% Shoreline Crown	20
% Shoreline Patent	80

Estimated Phosphorus Supply (Annual)

Upstream Lakes	1160	lbs.	29%
Land Runoff	670		17
Atmosphere	1755		45
Shoreline Develop.	362		9

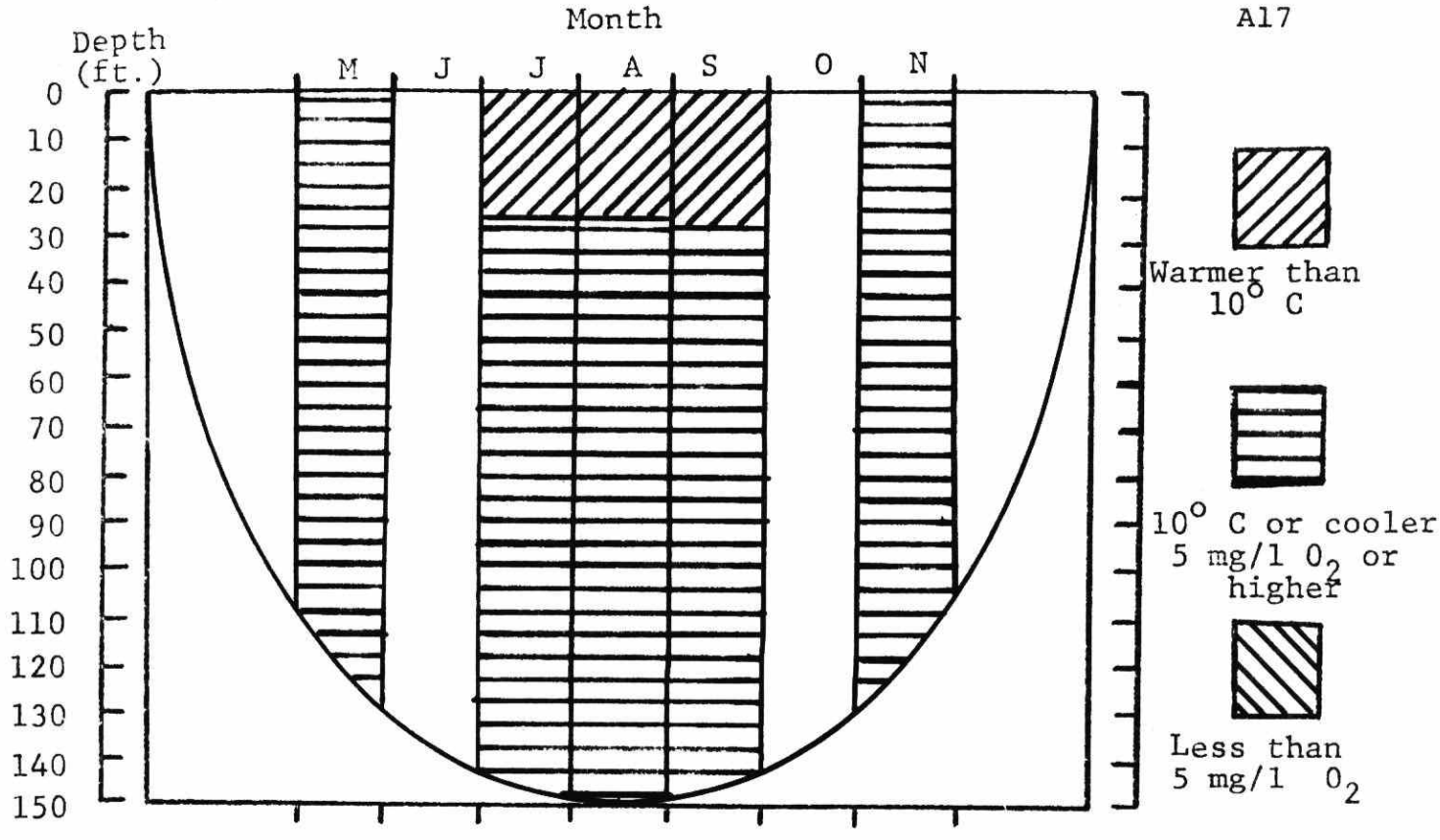
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18	2.3	7	79	110	15	318	L 0.05	8.0

L = less than

Devil Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake supports a moderate to high level of development. The 1975 survey revealed a moderately high level of enrichment at 2.3 ug/l chlorophyll. The oxygen profiles demonstrate good water quality conditions for lake trout but progressive depletion of oxygen from August to October. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further oxygen depletion resulting from additional shoreline development.



DICKEY LAKE

Morphometry Hydrology

Surface Area	368	acres
Mean Depth		feet
Maximum Depth	152	feet
Volume		acre - feet
Watershed Area	2.1	square miles
Flushing Rate		times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	144
Vacant Lots	144
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	35
% Shoreline Patent	65

Estimated Phosphorus Supply (Annual)

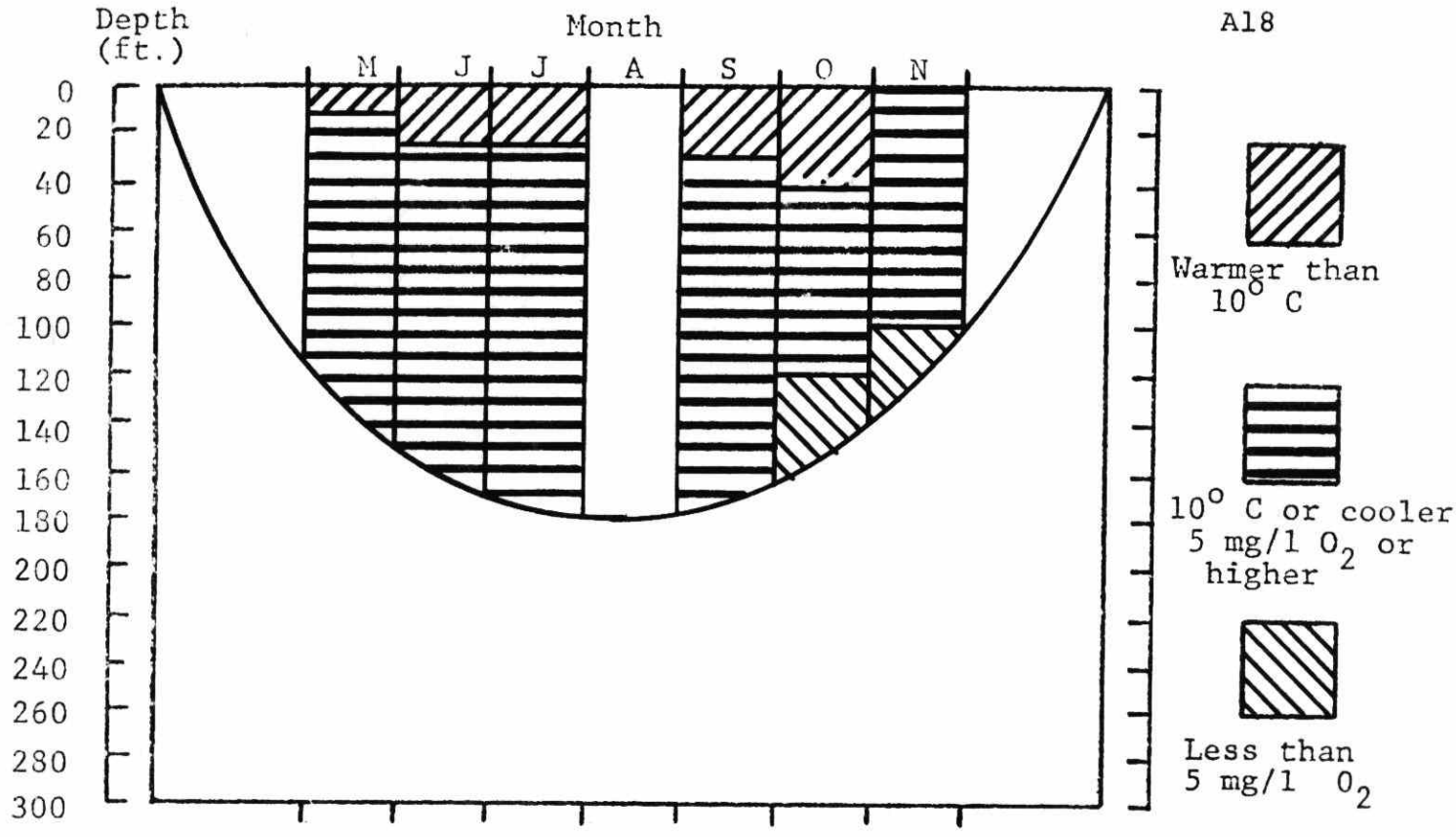
Upstream Lakes	487	lbs.	45%
Land Runoff	48		4
Atmosphere	246		23
Shoreline Develop.	300		28

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	1.0	18	60	88	8	356	0.05	7.4

Dickey Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is extensively developed or committed for development. The 1976 survey revealed a low level of enrichment of 1.0 ug/l chlorophyll. The oxygen profiles demonstrate excellent water quality conditions for lake trout. Based on the lake's relatively large volume of deep water, its oxygen resource is considered to be relatively insensitive to depletion resulting from further shoreline development.



DOG LAKE - NORTHEAST BASIN

Morphometry Hydrology

Surface Area	1,164	acres
Mean Depth		feet
Maximum Depth	163	feet
Volume		acre - feet
Watershed Area	23.9	square miles
Flushing Rate		times per year
Water Level Fluct.	7.0	feet

Shoreline Development

Cottages, Homes	113
Vacant Lots	18
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

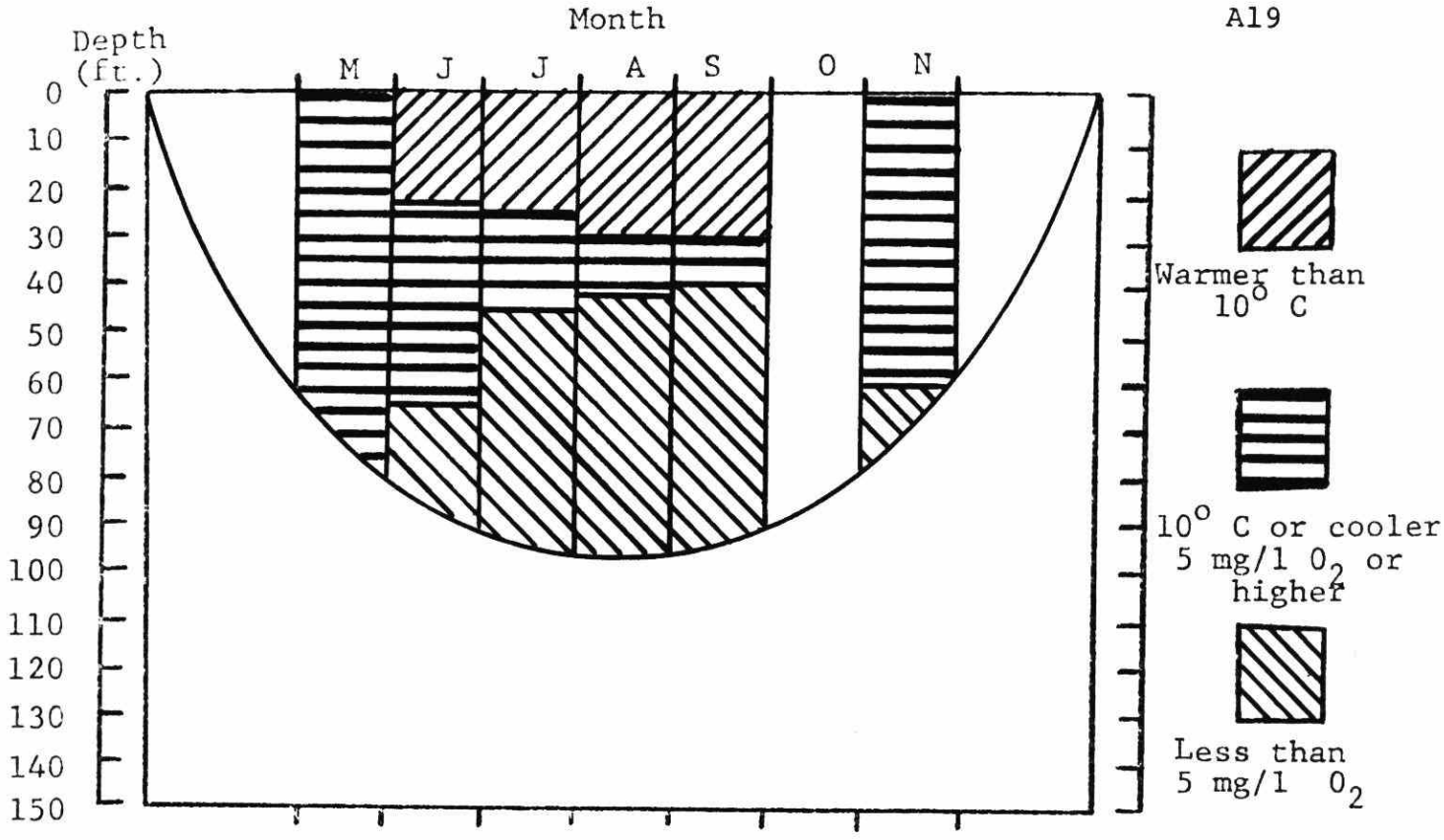
Upstream Lakes	251 lbs.	15%
Land Runoff	509	30
Atmosphere	780	46
Shoreline Develop.	154	9

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
9	8.7	10	55	105	33	637	0.20	7.8

Dog Lake for fisheries management purposes is currently considered to have an extinct lake trout population. The shoreline of the lake (north-east basin) supports a moderate level of development. The 1975 survey revealed an extremely high level of enrichment of 8.7 ug/l chlorophyll. The oxygen profiles for the basin indicate good water quality conditions for lake trout. While the reasons for the lake's excessively high chlorophyll level and good oxygen conditions are not entirely understood, the lake's large deep water volume and good flushing action suggest that the lake's oxygen resource is insensitive to further oxygen depletion resulting from additional shoreline development. Further sampling of the lake is required.



DRAPER LAKE

Morphometry Hydrology

Surface Area	230	acres
Mean Depth	44	feet
Maximum Depth	97	feet
Volume	10,238	acre - feet
Watershed Area	1.9	square miles
Flushing Rate	0.13	times per year
Water Level Fluct.	1.0	feet

Shoreline Development

Cottages, Homes	23
Vacant Lots	4
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

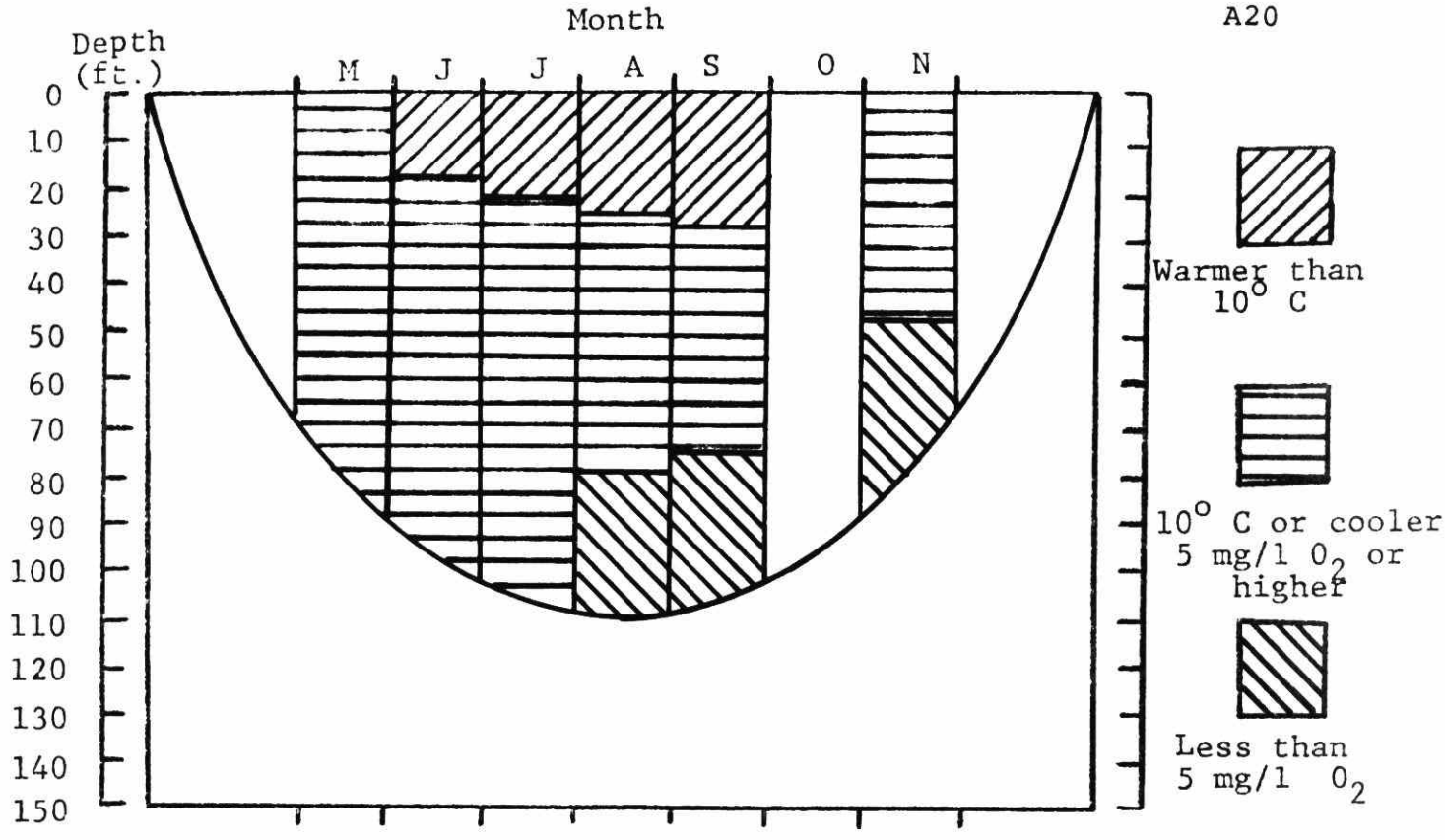
Upstream Lakes	0 lbs.	0%
Land Runoff	86	32
Atmosphere	153	57
Shoreline Develop.	31	11

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
16	2.2	5	126	164	11	411	0.18	7.3

Draper Lake is considered for purposes of fisheries management to have an extinct lake trout population. The shoreline of the lake is only sparsely developed. The 1976 survey revealed a moderate level of enrichment at 2.2 ug/l chlorophyll. The oxygen profiles indicate suitable water quality conditions for lake trout and a possible potential to re-activate a lake trout fishery. The lake has a reasonably large volume of deep water in proportion to its surface area and therefore is considered to have a moderate sensitivity to oxygen depletion resulting from further shoreline development.



EAGLE LAKE

Morphometry Hydrology

Surface Area	1,643	acres
Mean Depth	33	feet
Maximum Depth	102	feet
Volume	54,472	acre-feet
Watershed Area	15.5	square miles
Flushing Rate	0.20	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	135
Vacant Lots	94
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	5
% Shoreline Patent	95

Estimated Phosphorus Supply (Annual)

Upstream Lakes	71	lbs.	4%
Land Runoff	474		26
Atmosphere	1,102		60
Shoreline Develop.	190		10

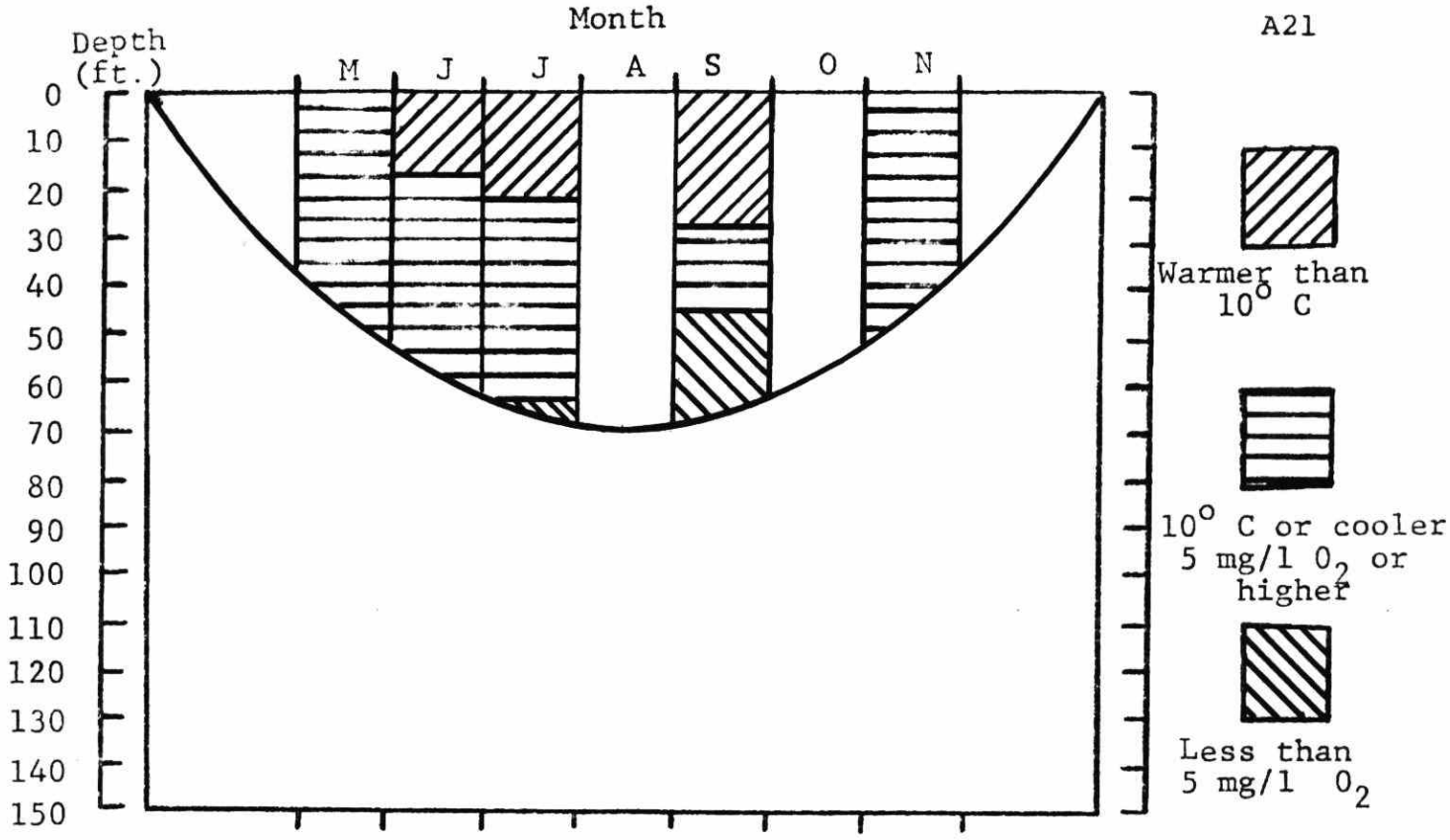
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	present
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	2.3	5	47	83	18	369	L 0.05	7.9

L = less than

Eagle Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is largely in private ownership with 135 developed and a further 94 vacant lots. The 1975 survey revealed a moderate level of enrichment at 2.3 ug/l chlorophyll. The oxygen profiles for Eagle Lake indicate good water quality conditions for lake trout however the oxygen data also demonstrate strong photosynthetic activity below the thermal barrier and a significant dependence upon this source of oxygen input to maintain the deep water oxygen supply. Considering this factor and the large number of vacant lots on Eagle Lake, further phosphorus inputs should be prevented.



EFFINGHAM LAKE

Morphometry Hydrology

Surface Area	798	acres
Mean Depth		feet
Maximum Depth	70	feet
Volume		acre - feet
Watershed Area	18.4	square miles
Flushing Rate		times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, homes	7
Vacant lots	1
Tourist camps	0
Tent, trailer sites	0
% Shoreline crown	95
% Shoreline patent	5

Estimated Phosphorus Supply (Annual)

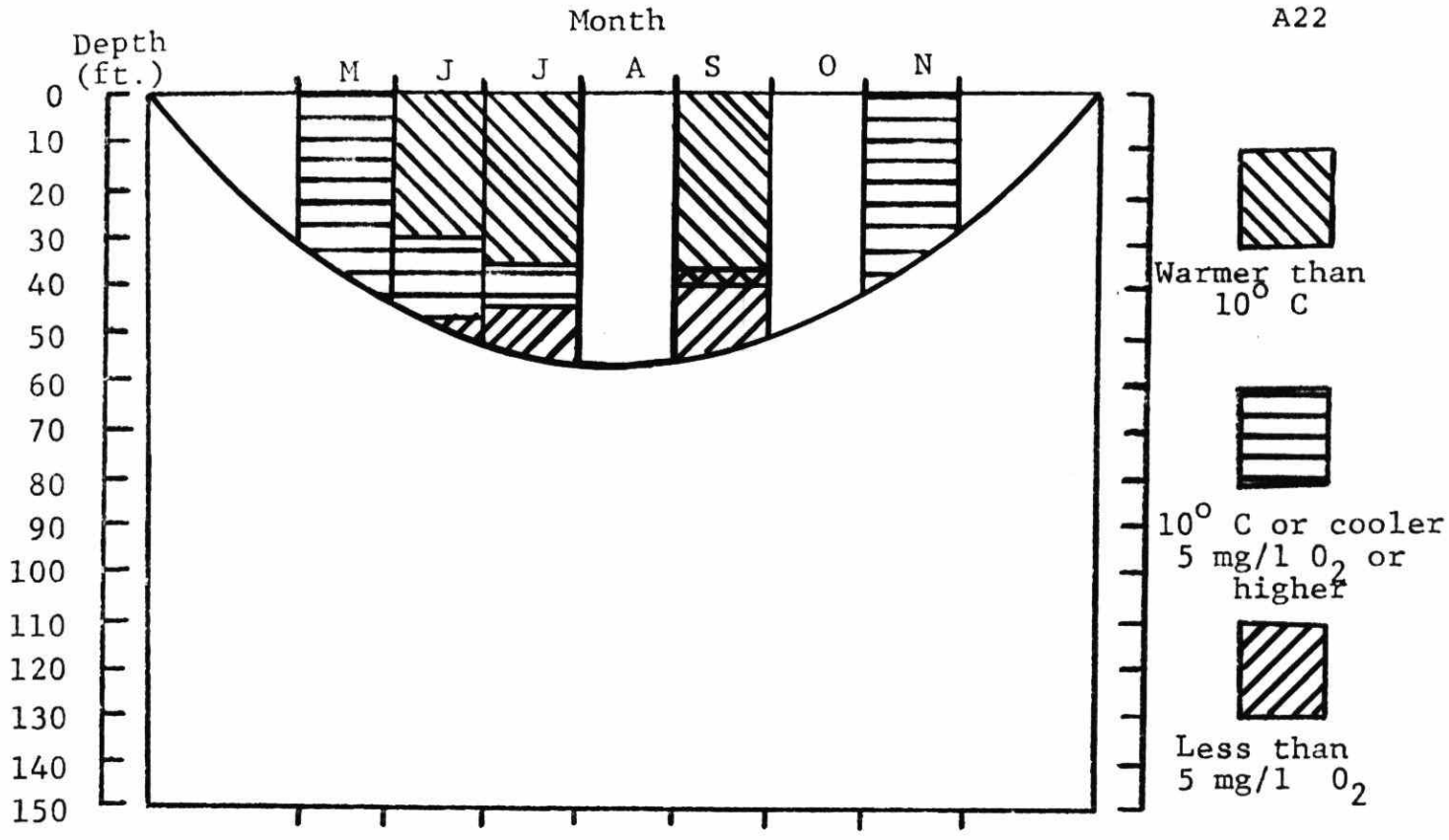
Upstream Lakes	0	lbs.	0 %
Land runoff	208		28
Atmosphere	534		71
Shoreline Develop.	10		1

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P. ug/l	Total N ug/l	Iron mg/l	pH
10	2.0	30	6	30	15	418	0.30	6.1

Effingham Lake supports a population of naturally reproducing lake trout. The shoreline of the lake is practically undeveloped. The 1976 survey revealed a moderate level of enrichment at 2.0 ug/l chlorophyll. The oxygen profiles indicate good water quality conditions for lake trout. The lake is very shallow with only a small deep water volume and therefore considered to be highly sensitive to oxygen depletion resulting from additional phosphorus inputs.



FORTUNE LAKE

Morphometry Hydrology

Surface Area	539	acres
Mean Depth	24	feet
Maximum Depth	57	feet
Volume	13,674	acre-feet
Watershed Area	26.2	square miles
Flushing Rate	1.42	times per year
Water Level Fluct.	1.3	feet

Shoreline Development

Cottages, Homes	1
Vacant Lots	0
Tourist Camps	
Tent, Trailer Sites	8
% Shoreline Crown	98
% Shoreline Patent	2

Estimated Phosphorus Supply (Annual)

Upstream Lakes	304 lbs.	37%
Land Runoff	156	19
Atmosphere	360	43
Shoreline Develop.	12	1

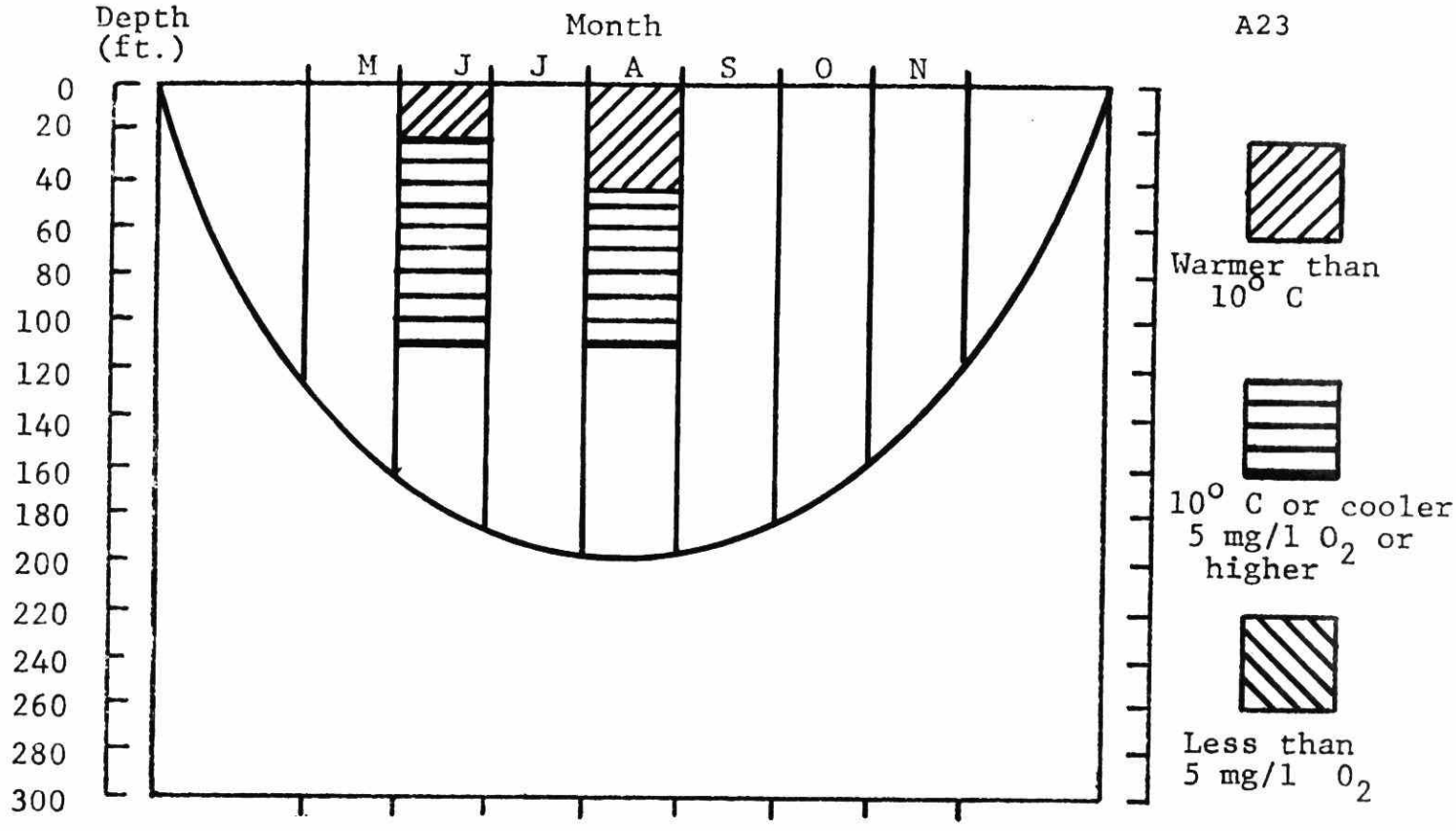
Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
24	2.0	L 8	58	89	10	290	L 0.07	7.7

L = less than

Fortune Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is practically undeveloped with only 2 percent in private ownership. The 1976 survey revealed a moderate level of enrichment at 2.1 ug/l of chlorophyll and the oxygen profiles for the lake indicate poor lake trout habitat with oxygen and temperature stresses occurring by September. While the lake has a fairly high flushing rate, it would appear from the existing oxygen conditions that the lake's shallow depth and limited deep water volume is the significant sensitivity factor and that further phosphorus inputs to the lake would be inadvisable.



GOULD LAKE

Morphometry Hydrology

Surface Area	491	acres
Mean Depth	72	feet
Maximum Depth	200	feet
Volume	32,249	acre-feet
Watershed Area	3.9	square miles
Flushing rate		times per year
Water Level Fluct.	1.5	feet

Shoreline Development

Cottages, Homes	18
Vacant Lots	16
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

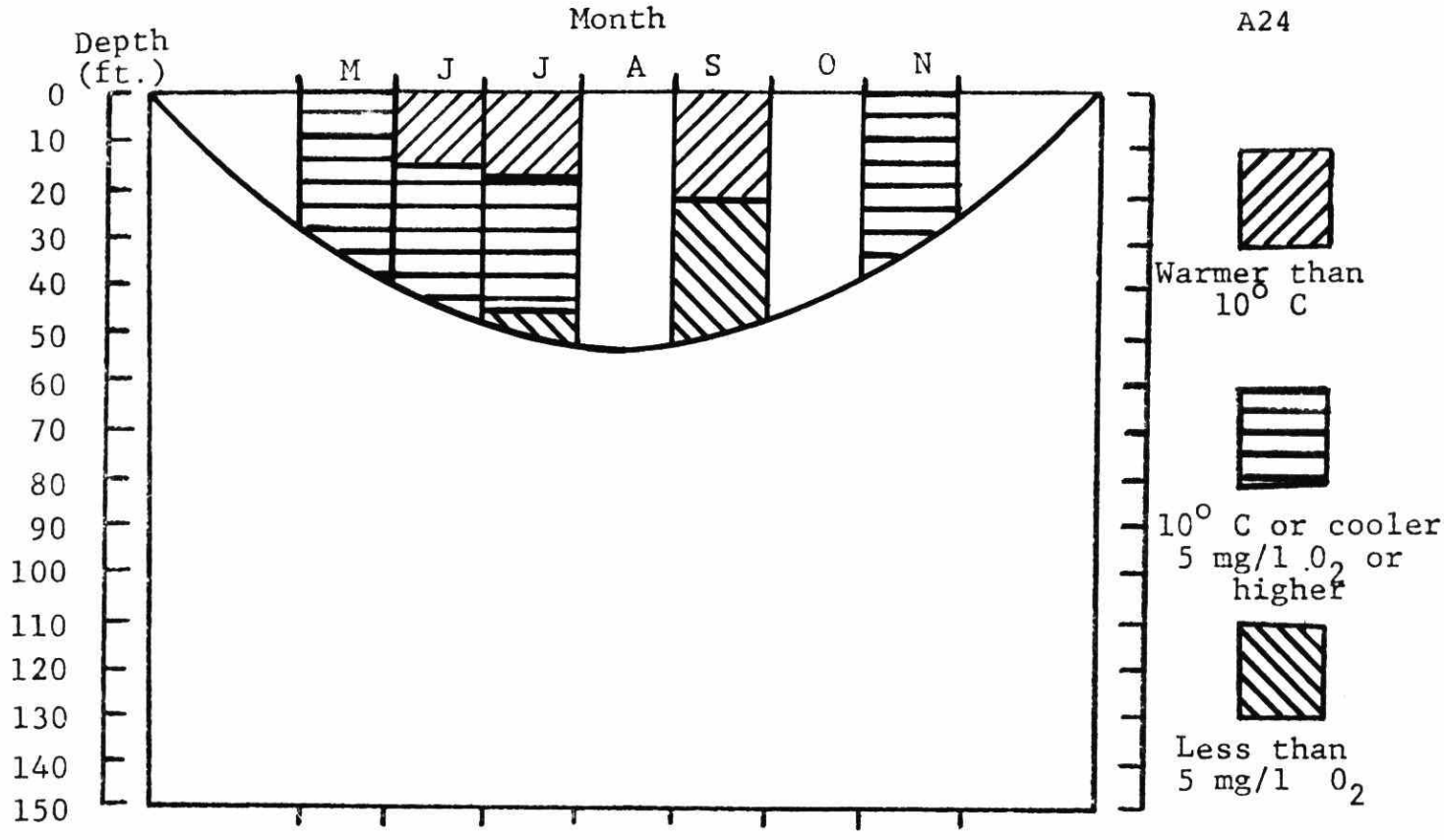
Upstream Lakes	0	lbs.	0%
Land Runoff	97		21
Atmosphere	342		74
Shoreline Develop.	24		5

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH

Gould Lake supports a population of native and hatchery stock lake trout. The shoreline of the lake is only sparsely developed. The 1976 study of Gould Lake carried out by students of St. Lawrence College in Kingston indicated a low to moderate level of enrichment however insufficient sampling for chlorophyll was undertaken to provide a reliable average. The oxygen profile was measured only to a depth of 110 feet but revealed excellent water quality for lake trout. Owing to the lake's very large volume of deep water, its oxygen resource is considered to be insensitive to depletion from further shoreline development.



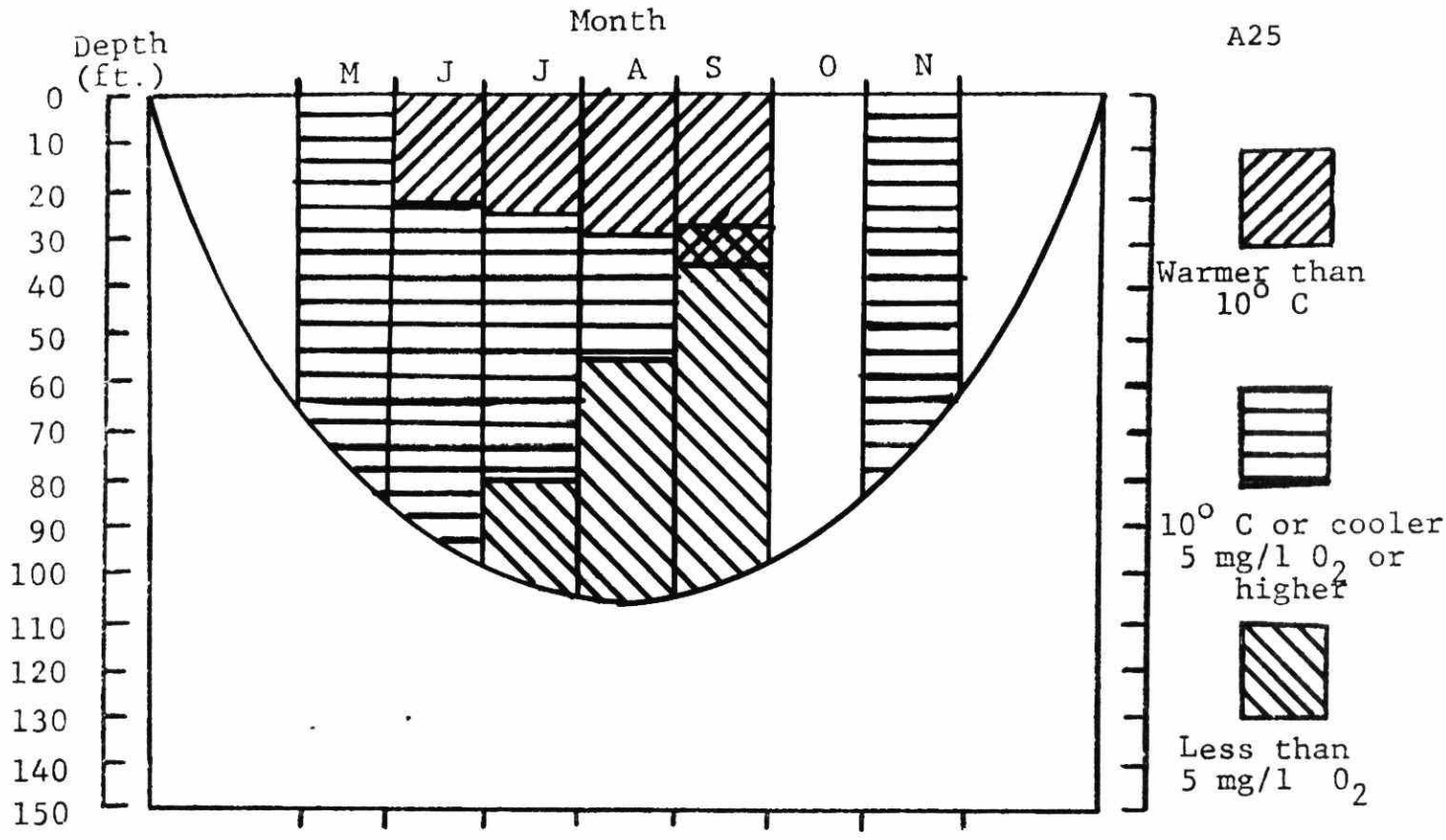
GRIMSTHORPE LAKE

Morphometry Hydrology			Shoreline Development	
Surface Area	232	acres	Cottages, Homes	0
Mean Depth		feet	Vacant Lots	0
Maximum Depth	50	feet	Tourist Camps	0
Volume		acre - feet	Tent, Trailer Sites	0
Watershed Area	32.5	square miles	% Shoreline Crown	100
Flushing Rate		times per year	% Shoreline Patent	0
Water Level Fluct.		feet		

Estimated Phosphorus Supply (Annual)			Indicator Food Organisms	
Upstream Lakes	269 lbs.	19%	Ponteporeia affinis	not detected
Land Runoff	1006	70	Mysis relecta	not detected
Atmosphere	155	11	Lake Herring	not detected
Shoreline Develop.	0	0		

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
10	1.6	35	6	34	10	428	0.25	6.2

Grimsthorpe Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is undeveloped and owned by the Crown. The 1976 survey revealed a fairly low level of enrichment of 1.6 ug/l chlorophyll. The oxygen profiles indicate poor late summer water quality conditions for lake trout with temperature and oxygen stresses occurring in September. The lake is shallow with a small deep water volume and therefore considered to be highly sensitive to further phosphorus inputs.



HUNGRY LAKE

Morphometry Hydrology

Surface Area	630	acres
Mean Depth	26	feet
Maximum Depth	105	feet
Volume	16,634	acre-feet
Watershed Area	27.0	square miles
Flushing Rate	1.19	times per yr.
Water Level Fluct.	0	feet

Shoreline Development

Cottages, Homes	17
Vacant Lots	9
Tourist Camps	16
Tent, Trailer Sites	0
% Shoreline Crown	63
% Shoreline Patent	37

Estimated Phosphorus Supply (Annual)

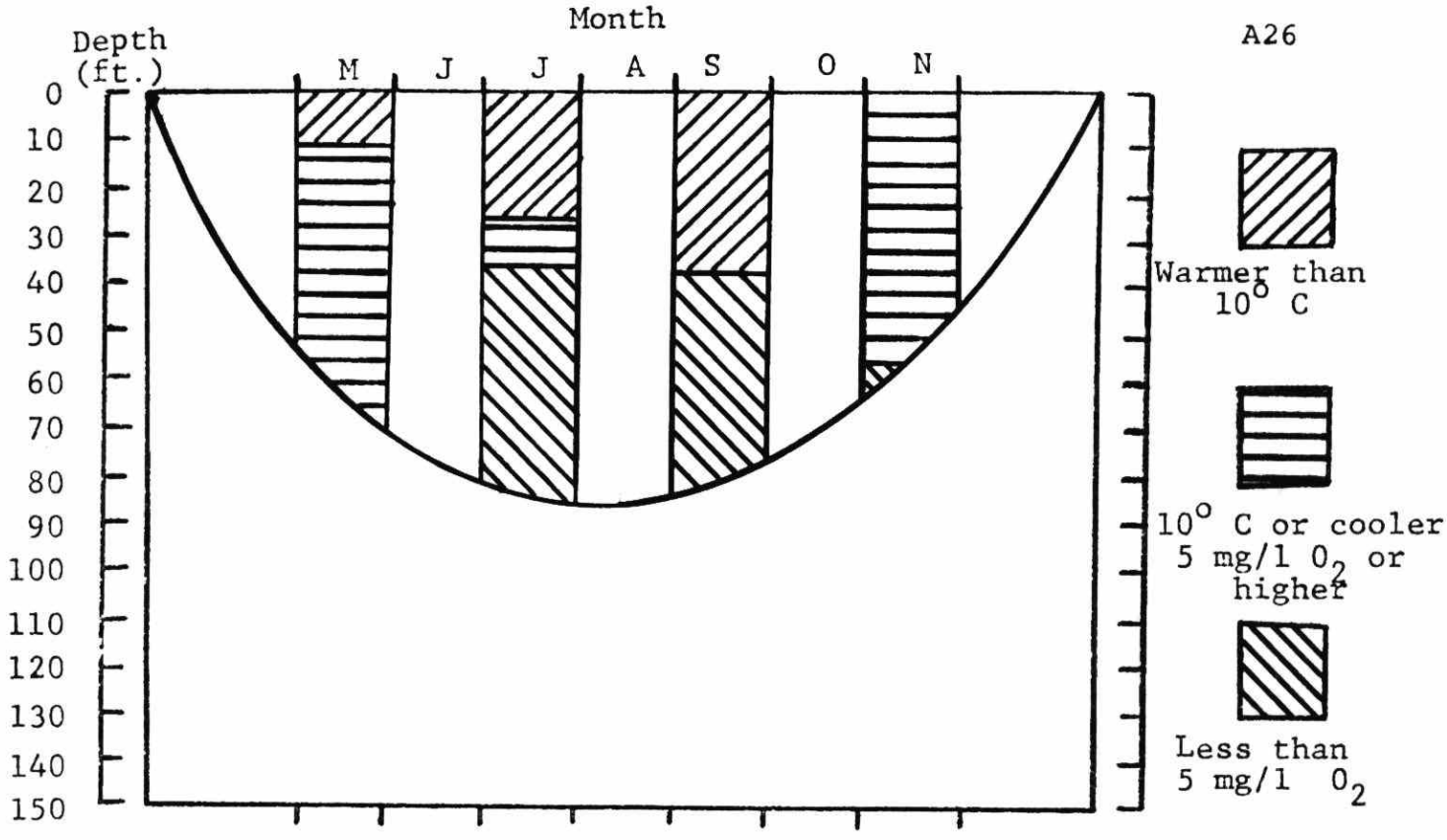
Upstream Lakes	0	lbs.	0%
Land Runoff	1,454		76
Atmosphere	422		22
Shoreline Develop.	45		2

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	present
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
10	3.6	35	16	35	12	425	0.33	6.9

Hungry Lake supports a naturally reproducing population of hatchery stock lake trout. The lake is only sparsely developed and the Crown owns approximately 63 percent of its shoreline. The 1976 survey revealed a high level of enrichment at 3.6 ug/l chlorophyll. The oxygen profiles indicate good water quality for lake trout until September at which time temperature and oxygen stresses are indicated. The condition in Hungry Lake reflects the lake's relatively small volume of deep water. The lake is considered sensitive to further phosphorus inputs.



INDIAN LAKE

Morphometry Hydrology

Surface Area	657	acres
Mean Depth	33	feet
Maximum Depth	85	feet
Volume	21,716	acre - feet
Watershed Area	138.6	square miles
Flushing Rate	4.72	times per year
Water Level Fluct.	1.5	feet

Shoreline Development

Cottages, Homes	91
Vacant Lots	23
Tourist Camps	5
Tent, Trailer Sites	0
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

Upstream Lakes	2,489 lbs.	78%
Land Runoff	141	4
Atmosphere	441	14
Shoreline Develop.	128	4

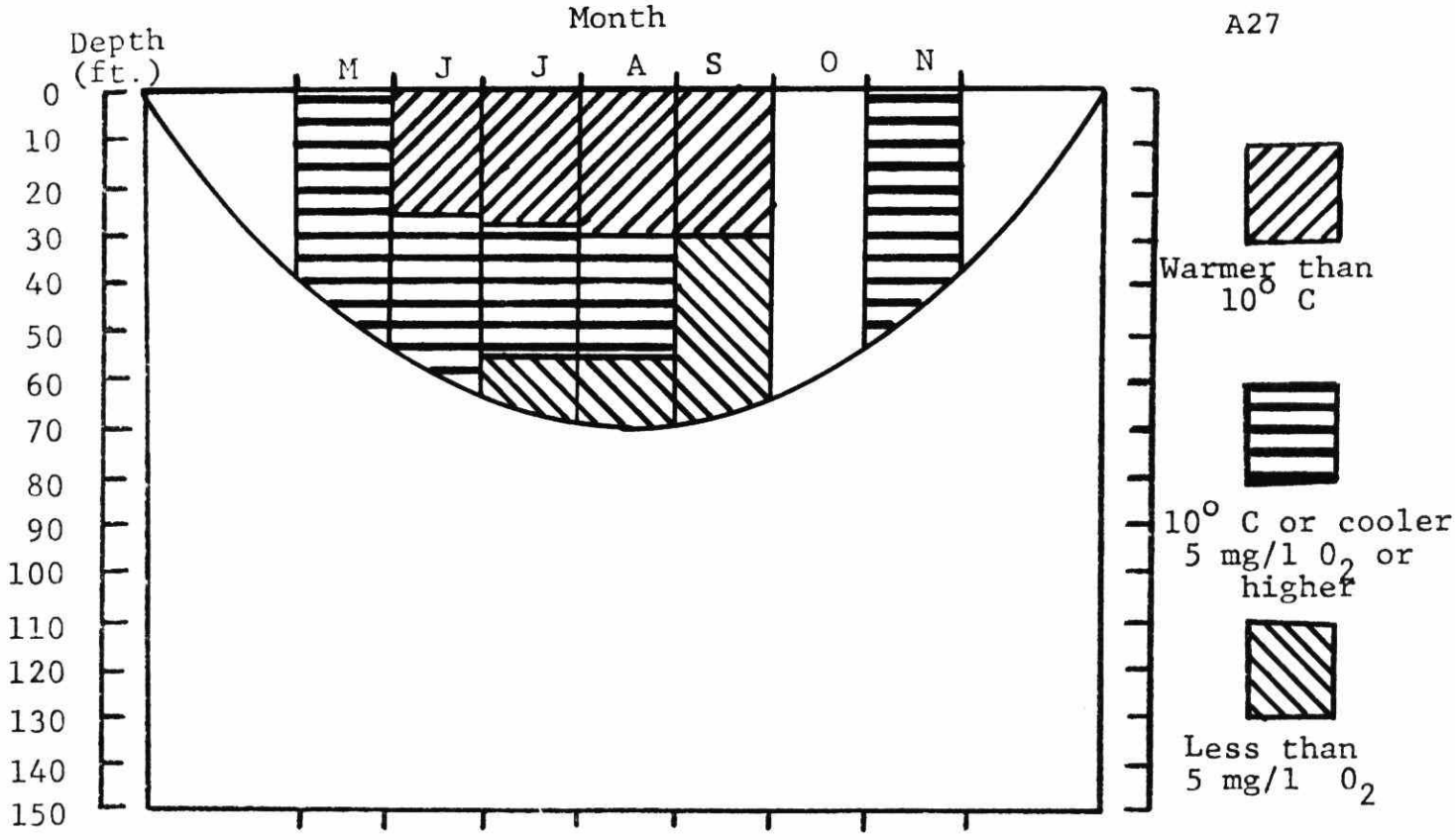
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
14	3.6	7	74	125	20	417	L 0.05	7.8

L = less than

Indian Lake supports a population of native and hatchery stock lake trout. The shoreline of the lake supports a moderate level of development. The 1975 survey of Indian Lake revealed a high level of enrichment at 3.6 ug/l chlorophyll. The oxygen profiles indicate poor water quality conditions for lake trout. The lake is situated on the Cataraqui River System and therefore experiences rapid flushing and gets most of its phosphorus supply from upstream lakes. For these reasons, the oxygen resource of Indian Lake is considered to be relatively insensitive to depletion from further shoreline development.



JOE PERRY LAKE

Morphometry Hydrology

Surface Area	418	acres
Mean Depth		feet
Maximum Depth	70	feet
Volume		acre-feet
Watershed Area	5.9	square miles
Flushing Rate		times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

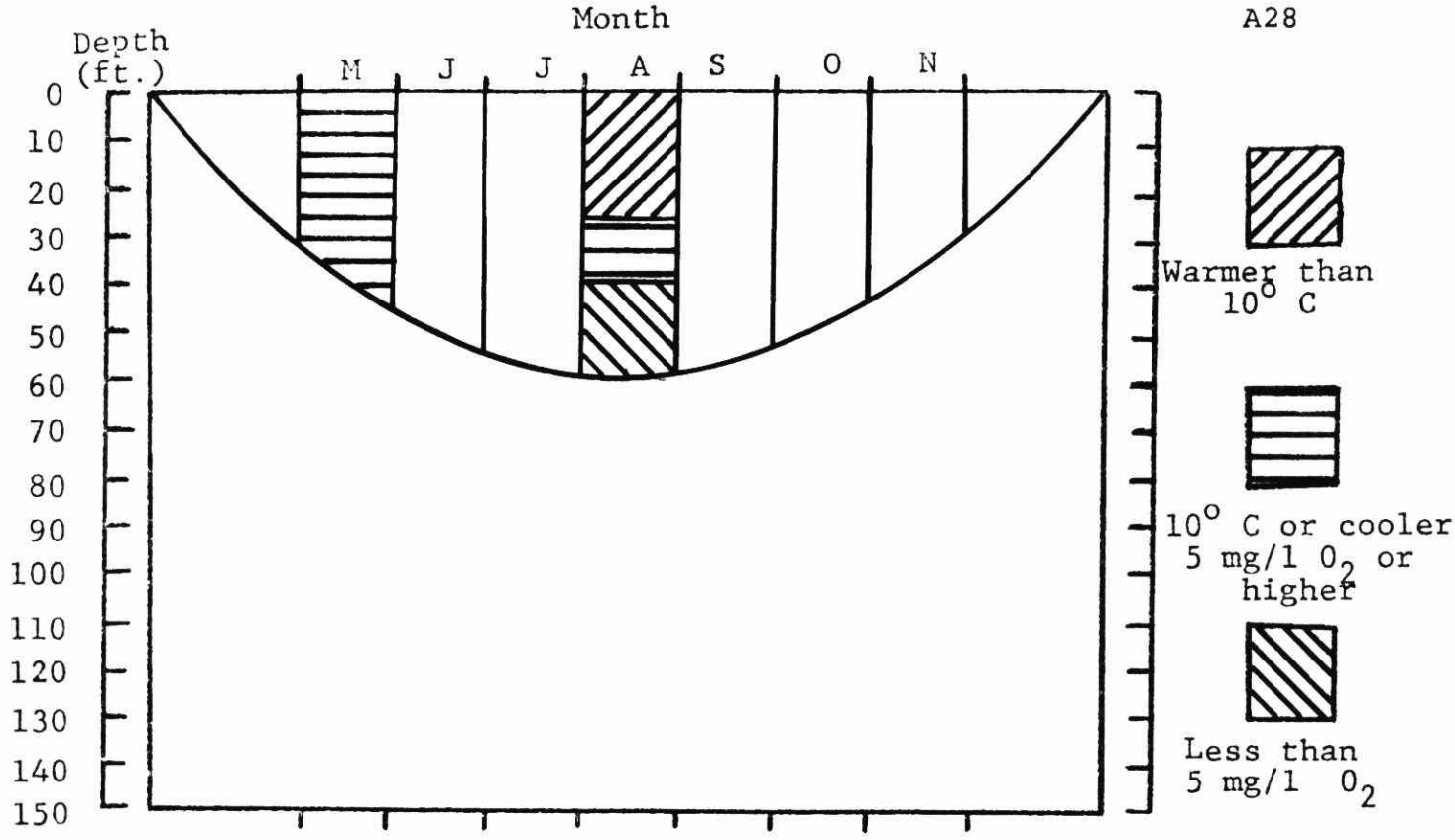
Upstream Lakes	0	lbs.	0%
Land Runoff	10		3
Atmosphere	279		97
Shoreline Develop.	0		0

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
15	1.7	15	11	26	9	293	0.10	6.4

Joe Perry Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is undeveloped and in Crown ownership. The 1976 survey revealed a relatively low level of enrichment at 1.7 ug/l of chlorophyll. The oxygen profiles indicate a condition of oxygen and temperature stress in September. The lake is shallow with a fairly small volume of deep water and is therefore considered to be sensitive to further phosphorus inputs.



KING LAKE

Morphometry Hydrology

Surface Area	94 acres
Mean Depth	28 feet
Maximum Depth	80 feet
Volume	2,561 acre - feet
Watershed Area	8.9 square miles
Flushing Rate	2.56 times per year
Water Level Fluct.	1.0 feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

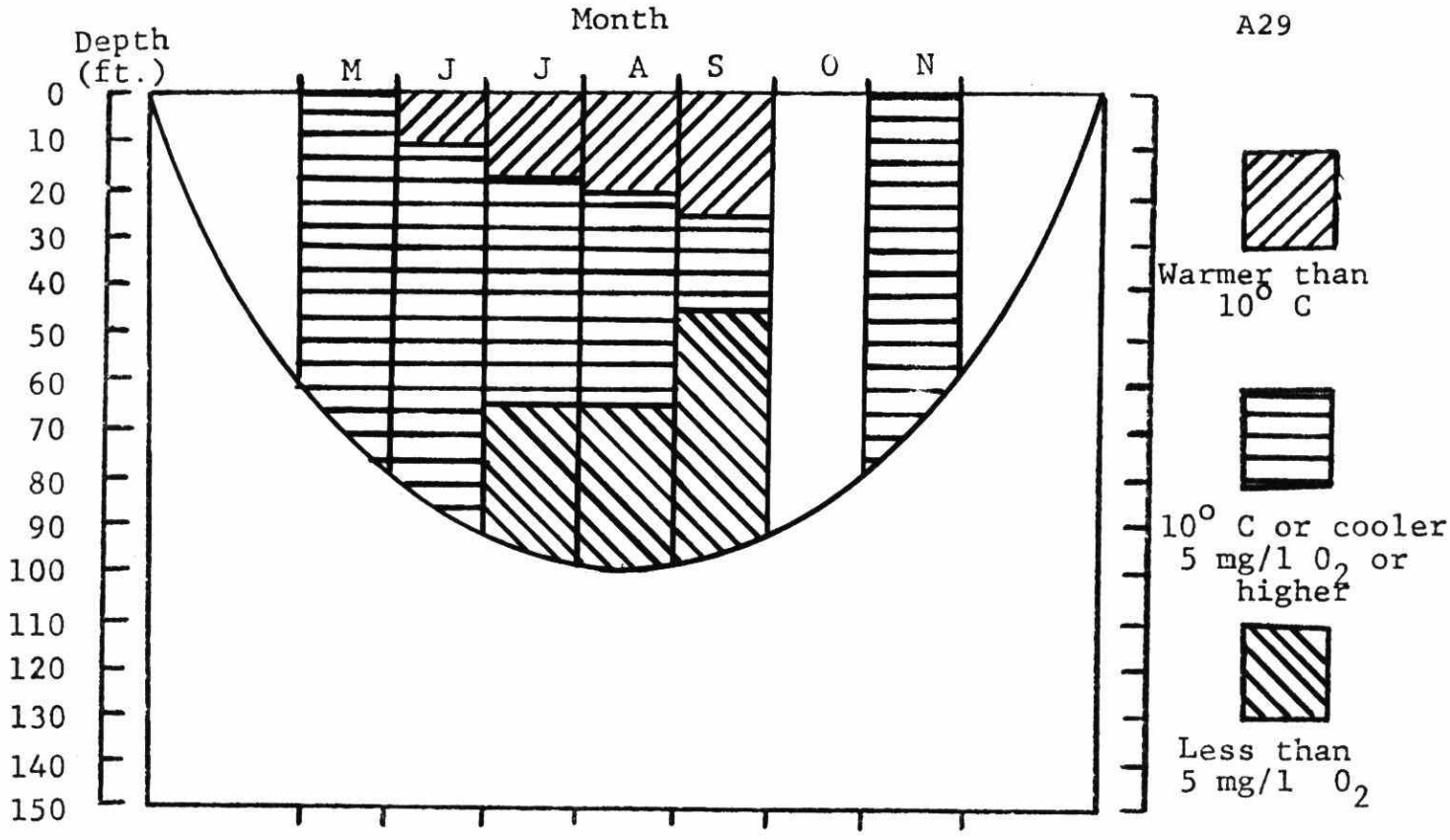
Upstream Lakes	171 lbs.	68%
Land Runoff	17	7
Atmosphere	62	25
Shoreline Develop.	0	0

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18		8	11	32	10	285	0.08	6.2

King Lake supports a population of hatchery stock lake trout. The shoreline of the lake is owned by the Crown and undeveloped. The lake was only sampled on two occasions and its enrichment status therefore cannot be defined. The August oxygen profile indicates marginally acceptable conditions for lake trout. While the lake has only a small volume of deep water, its rapid flushing rate suggests only a moderate sensitivity to further oxygen depletion resulting from shoreline development.



KISHKEBUS LAKE

Morphometry Hydrology

Surface Area	205	acres
Mean Depth	40	feet
Maximum Depth	108	feet
Volume	8,309	acre-feet
Watershed Area	9.8	square miles
Flushing Rate	0.87	times per year
Water Level Fluct.	1.5	feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

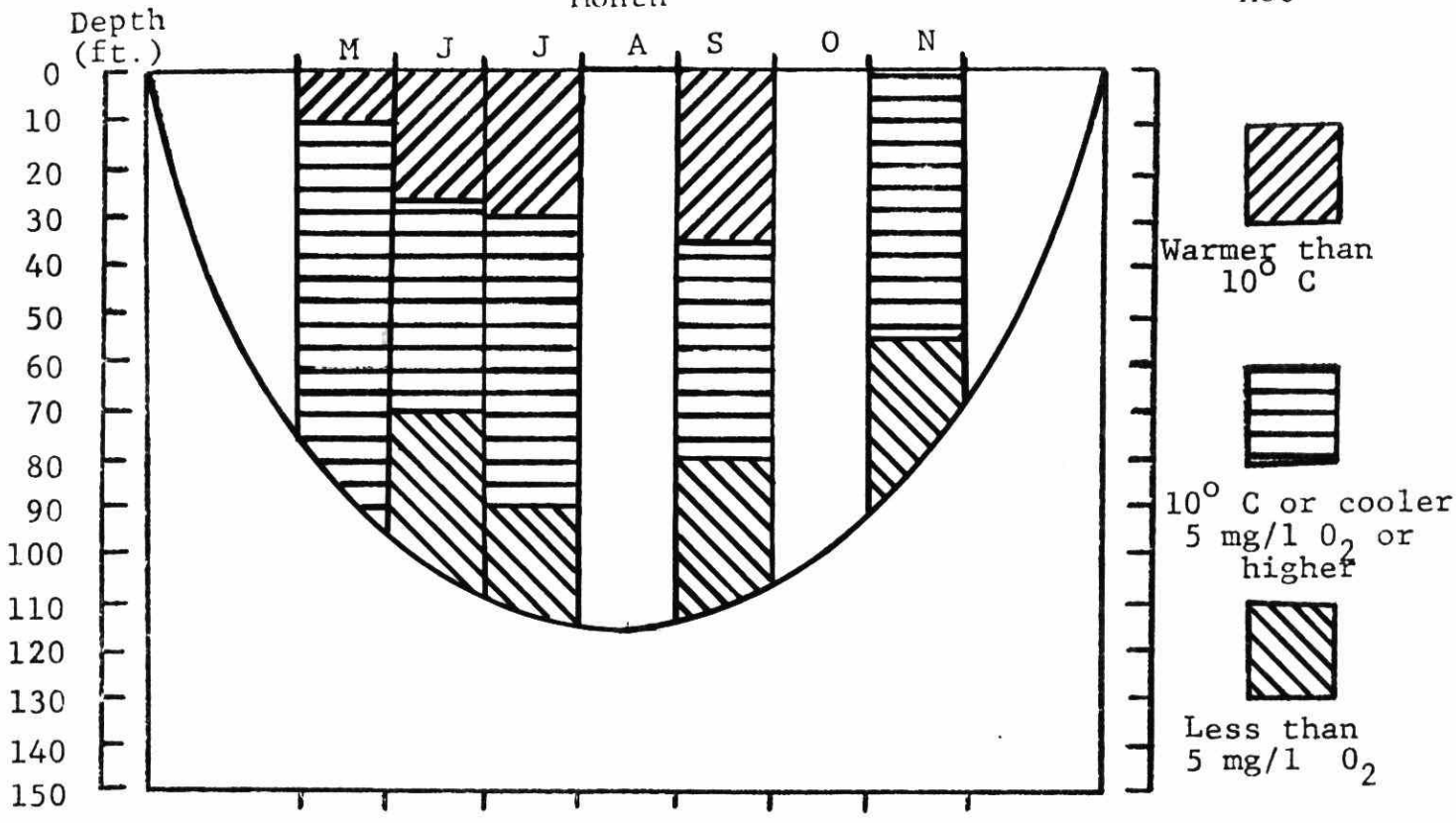
Upstream Lakes	50 lbs.	12%
Land Runoff	220	54
Atmosphere	138	34
Shoreline Develop.	0	0

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
14	2.2	17	24	49	8	338	0.15	6.9

Kishkebus Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is undeveloped. The 1976 survey revealed a moderately high level of enrichment at 2.2 ug/l chlorophyll. The oxygen profiles indicate suitable water quality conditions for lake trout. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further oxygen depletion resulting from shoreline development.



KNOWLTON LAKE

Morphometry Hydrology

Surface Area	450	acres
Mean Depth	32	feet
Maximum Depth	112	feet
Volume	14,429	acre-feet
Watershed Area	4.3	square miles
Flushing Rate	0.20	times per year
Water Level Fluct.	1.5	feet

Shoreline Development

Cottages, Homes	32
Vacant Lots	8
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

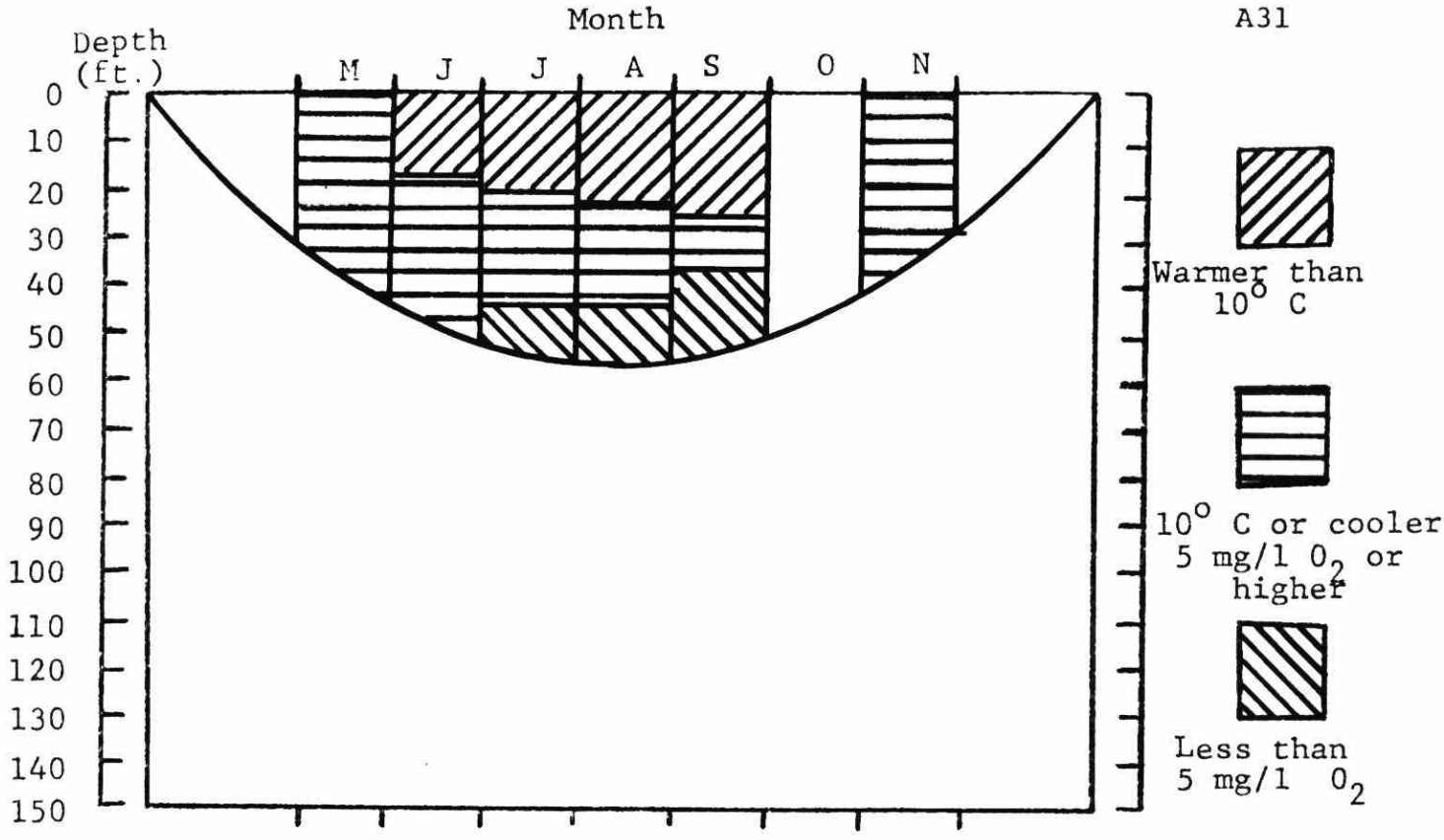
Upstream Lakes	0 lbs.	0%
Land Runoff	335	50
Atmosphere	300	45
Shoreline Develop.	35	5

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	1.9	15	110	160	14	408	0.15	7.8

Knowlton Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is entirely in private ownership and largely undeveloped. The 1975 survey revealed a moderate level of enrichment at 1.9 ug/l chlorophyll. The oxygen profiles indicate good water quality conditions for lake trout however the oxygen data also demonstrate strong photosynthetic activity below the thermal barrier and a significant dependence upon this source of oxygen reserve. Based on this factor, it is suggested that additional phosphorus inputs should be prevented.



LONG MALLORY LAKE

Morphometry Hydrology

Surface Area	158	acres
Mean Depth		feet
Maximum Depth	57	feet
Volume		acre-feet
Watershed Area	3.5	square miles
Flushing Rate		times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

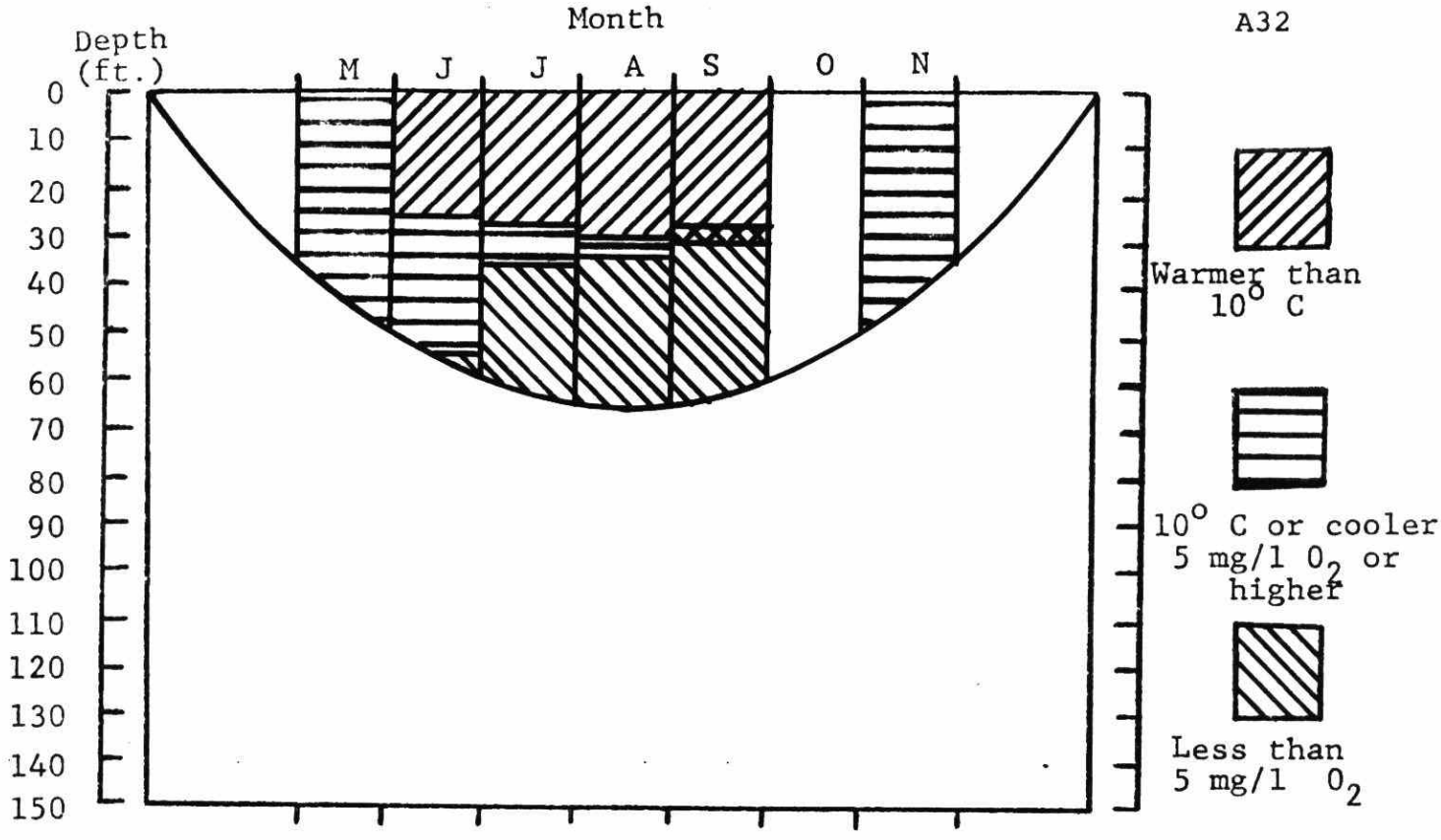
Upstream lakes	0	lbs.	0%
Land Runoff	184		64
Atmosphere	105		36
Shoreline Develop.	0		0

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
15	1.3	17	9	27	10	291	0.12	6.3

Long Mallory Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is undeveloped and owned by the Crown. The 1976 survey revealed a low level of enrichment at 1.3 ug/l chlorophyll. The oxygen profiles indicate suitable water quality conditions for lake trout. The lake is very shallow with a small volume of deep water and therefore considered sensitive to further nutrient inputs.



LONG SCHOONER LAKE

Morphometry Hydrology

Surface Area	494	acres
Mean Depth	23	feet
Maximum Depth	65	feet
Volume	11,381	acre-feet
Watershed Area	11.0	square miles
Flushing Rate	1.74	times per year
Water Level Fluct.	2.0	feet

Shoreline Development

Cottages, Homes	1
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

Upstream Lakes	311 lbs.	33%
Land Runoff	322	33
Atmosphere	331	34
Shoreline Develop.	1	0

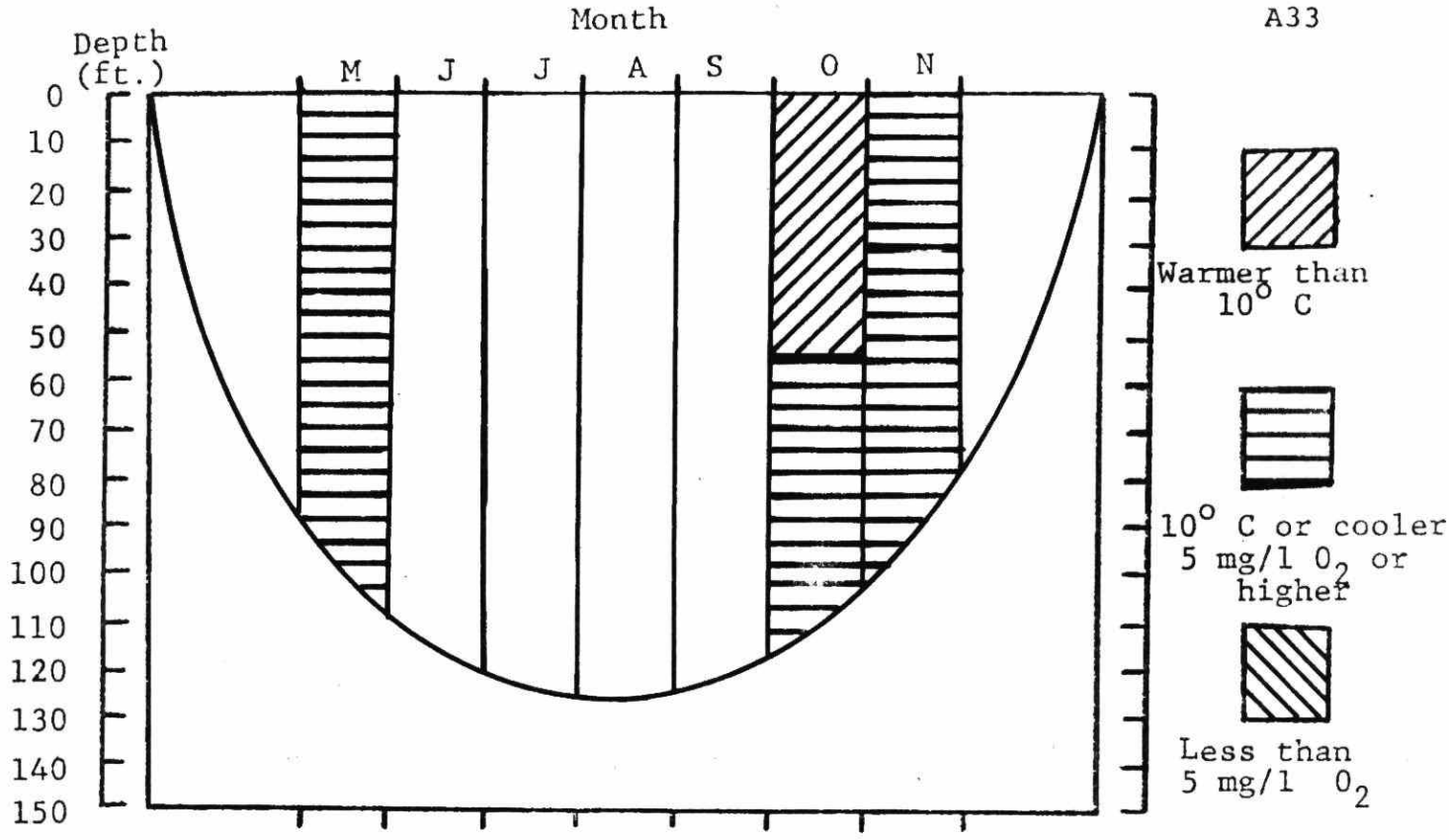
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	2.1	10	42	70	10	305	L 0.20	7.3

L = less than

Long Schooner Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is undeveloped and owned by the Crown. The 1976 survey revealed a moderate level of enrichment at 2.1 ug/l chlorophyll and the oxygen profiles for the lake indicate poor water quality conditions for lake trout with oxygen and temperature stresses occurring by September. While the lake has a fairly high flushing rate, it would appear from the existing oxygen conditions that the lake's shallow depth and limited deep water volume is the significant sensitivity factor and that further phosphorus inputs should not occur.



LOUGHBOROUGH LAKE

Morphometry Hydrology

Surface Area	1,824	acres
Mean Depth	48	feet
Maximum Depth	126	feet
Volume	86,840	acre-feet
Watershed Area	22.4	square miles
Flushing Rate	0.18	times per year
Water Level Fluct.	1.5	feet

Shoreline Development

Cottages, Homes	138
Vacant Lots	21
Tourist Camps	12
Tent, Trailer Sites	175
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

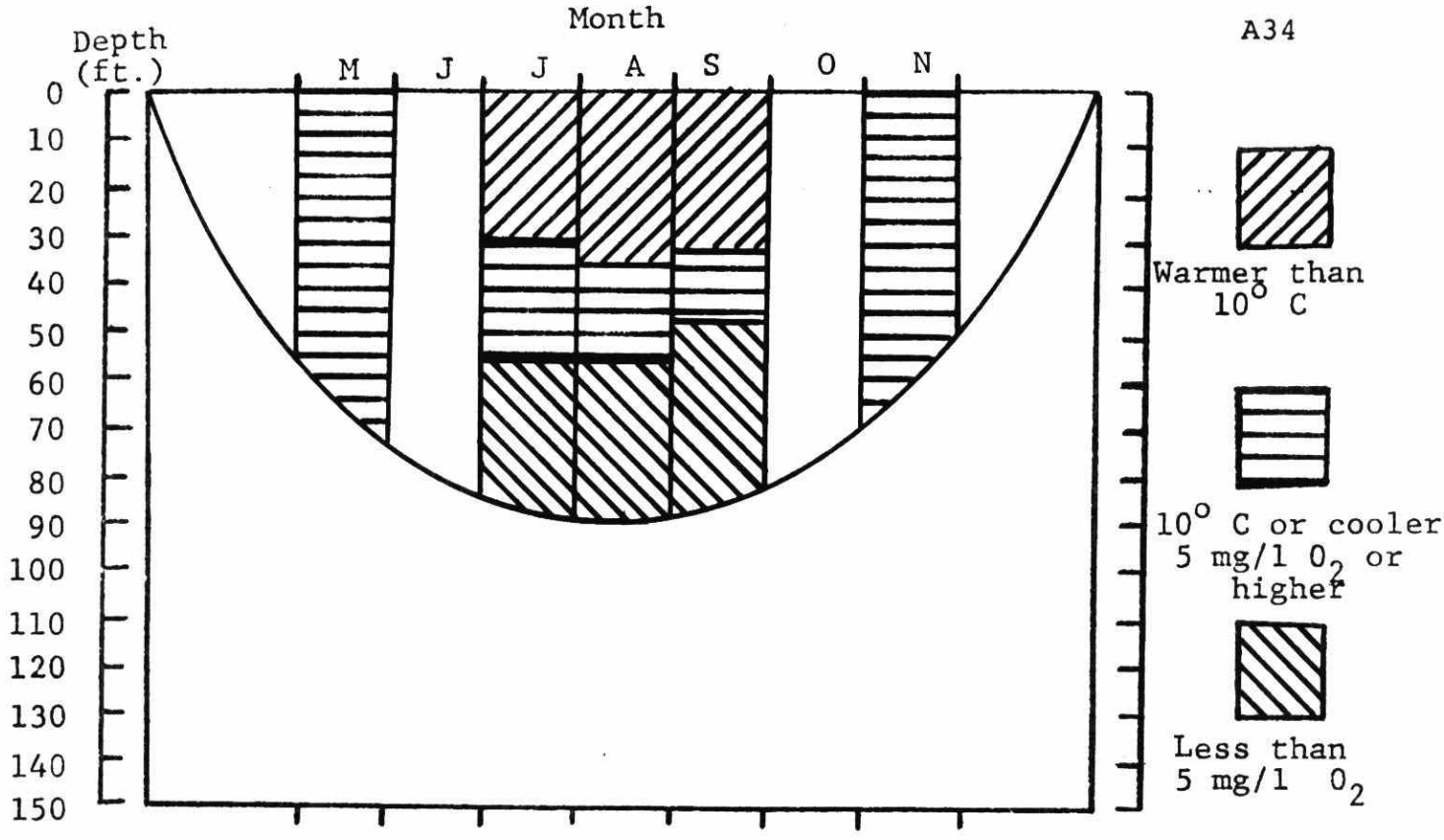
Upstream Lakes	0	lbs.	0%
Land Runoff	2,220		57
Atmosphere	1,221		31
Shoreline Develop.	441		12

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
14	2.0	5	112	164	22	397	0.35	8.0

Loughborough Lake (Western Basin) supports a population of native and naturally reproducing lake trout. The shoreline of the lake supports a moderate level of development. The 1975 survey of Loughborough Lake revealed a moderate level of enrichment at 2.0 ug/l chlorophyll. The oxygen profiles indicate good water quality conditions for lake trout. Owing to the lake's relatively large volume of deep water, its oxygen resource is considered to be relatively insensitive to depletion from further shoreline development.



LUCKY LAKE

Morphometry Hydrology

Surface Area	247	acres
Mean Depth		feet
Maximum Depth	91	feet
Volume		acre-feet
Watershed Area	3.2	square iles
Flushing Rate		times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	6
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

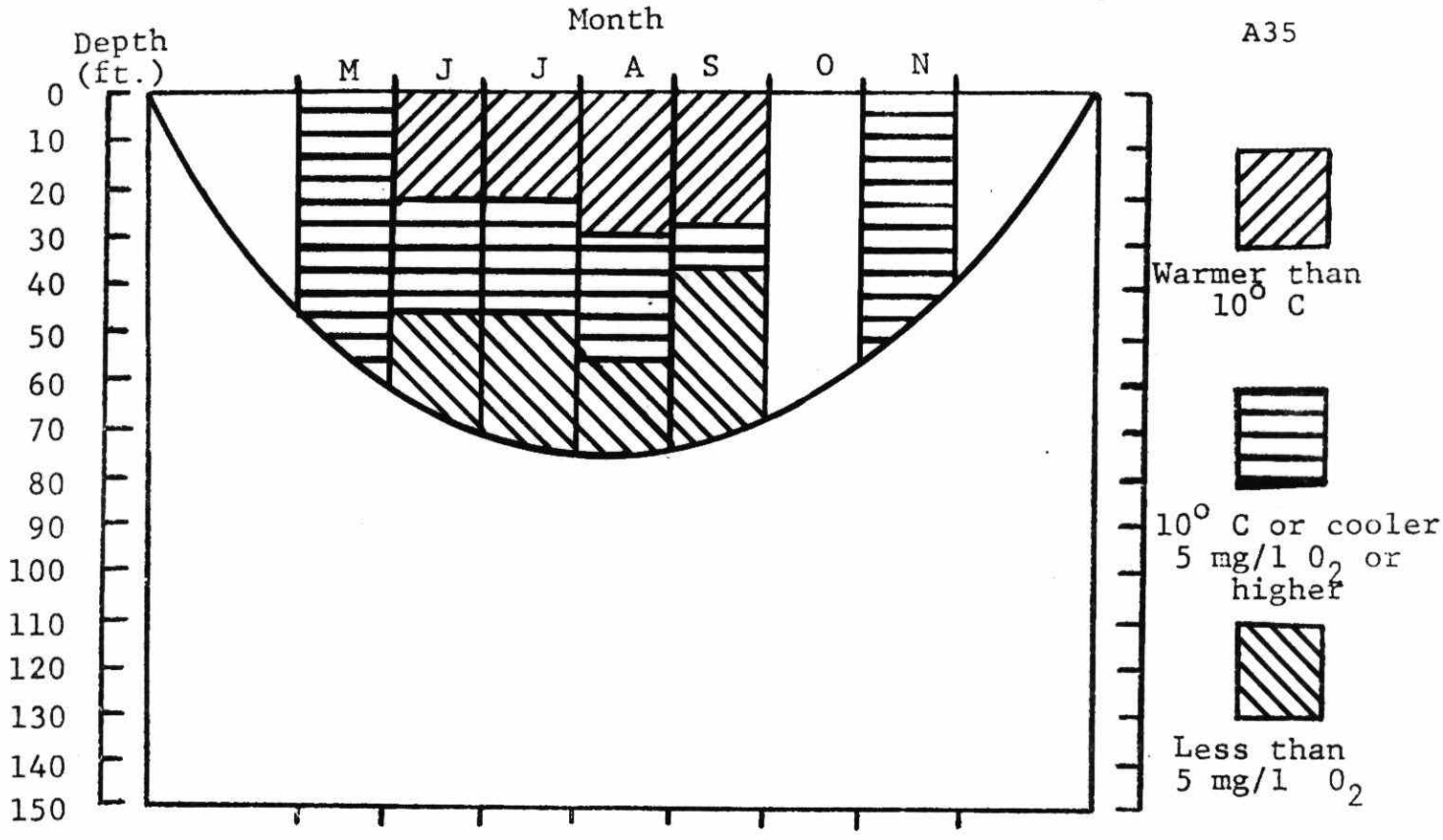
Upstream Lakes	19 lbs.	7%
Land Runoff	67	26
Atmosphere	165	64
Shoreline Develop.	8	3

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
25	2.2	5	41	67	15	283	0.08	7.1

Lucky Lake supports a population of native and naturally reproducing lake trout. There is practically no development on the lake at the present time. The 1976 survey revealed a moderate level of enrichment at 2.2 ug/l chlorophyll. The oxygen profiles indicate reasonably good water quality conditions for lake trout. Based on the limited volume of deep water present, the lake is considered to have an inherent sensitivity to phosphorus inputs.



MACKIE LAKE

Morphometry Hydrology

Surface Area	388	acres
Mean Depth	28	feet
Maximum Depth	75	feet
Volume	10,886	acre-feet
Watershed Area	15.6	square miles
Flushing Rate	1.06	times per year
Water Level Fluct.	2.2	feet

Shoreline Development

Cottages, Homes	56
Vacant Lots	0
Tourist Camps	34
Tent, Trailer Sites	
% Shoreline Crown	68
% Shoreline Patent	32

Estimated Phosphorus Supply (Annual)

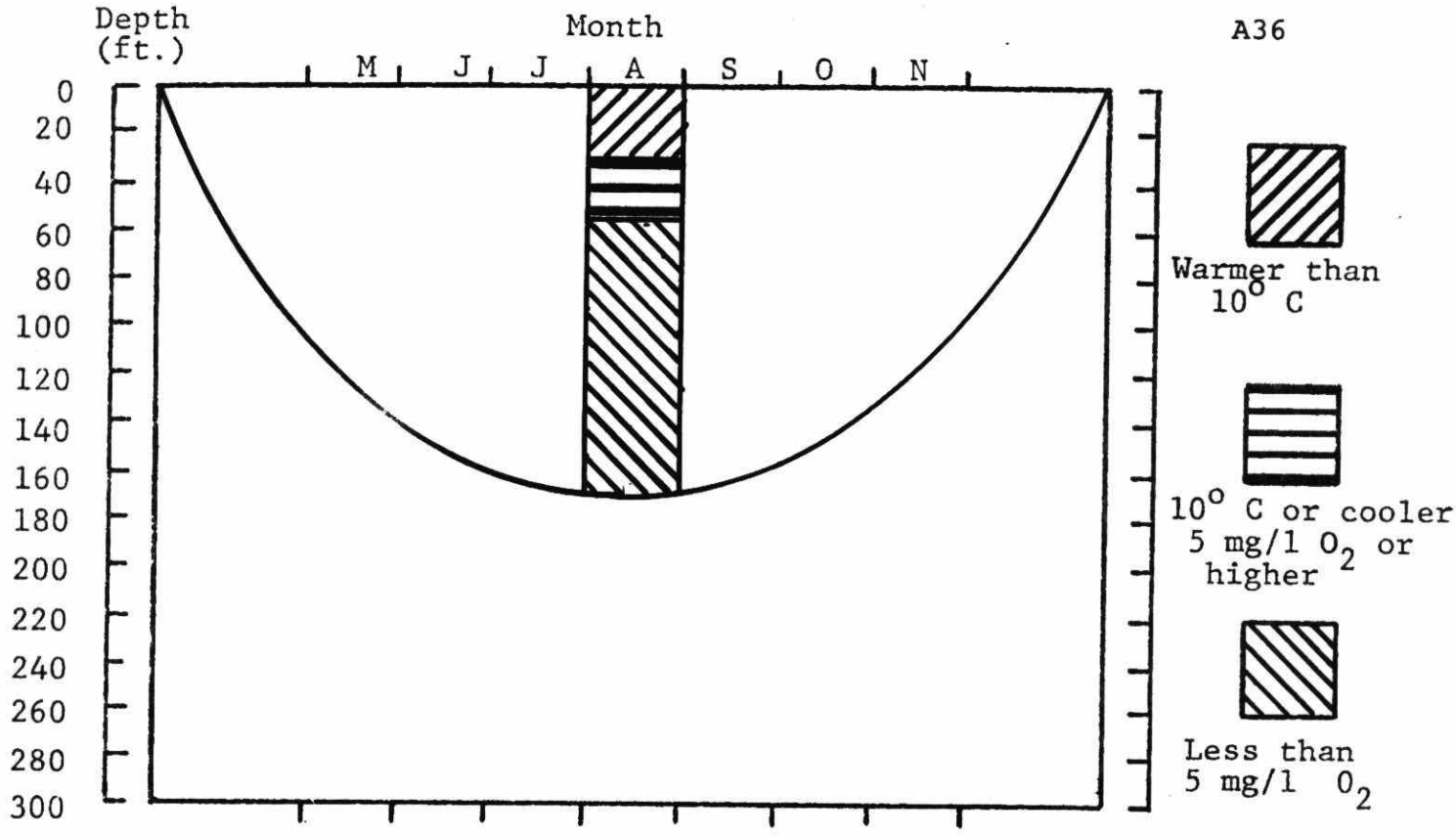
Upstream Lakes	54	lbs.	7%
Land Runoff	345		45
Atmosphere	259		34
Shoreline Develop.	102		14

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
19	2.4	7	34	60	11	304	0.08	7.1

Mackie Lake supports a population of native and naturally reproducing lake trout. Approximately 32 percent of the lake's shoreline is in private ownership and has an existing moderate level of development. The 1976 survey revealed a moderately high level of enrichment at 2.4 ug/l chlorophyll. The dissolved oxygen profiles indicate adequate oxygen to support a lake trout population however the lake has only a small volume of deep water and is considered to have a high sensitivity to further phosphorus inputs.



MAIR LAKE

Morphometry Hydrology

Surface Area	121	acres
Mean Depth	48	feet
Maximum Depth	173	feet
Volume	5,707	acre-feet
Watershed Area	0.7	square miles
Flushing Rate	0.08	times per year
Water Level Fluct.	0	feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

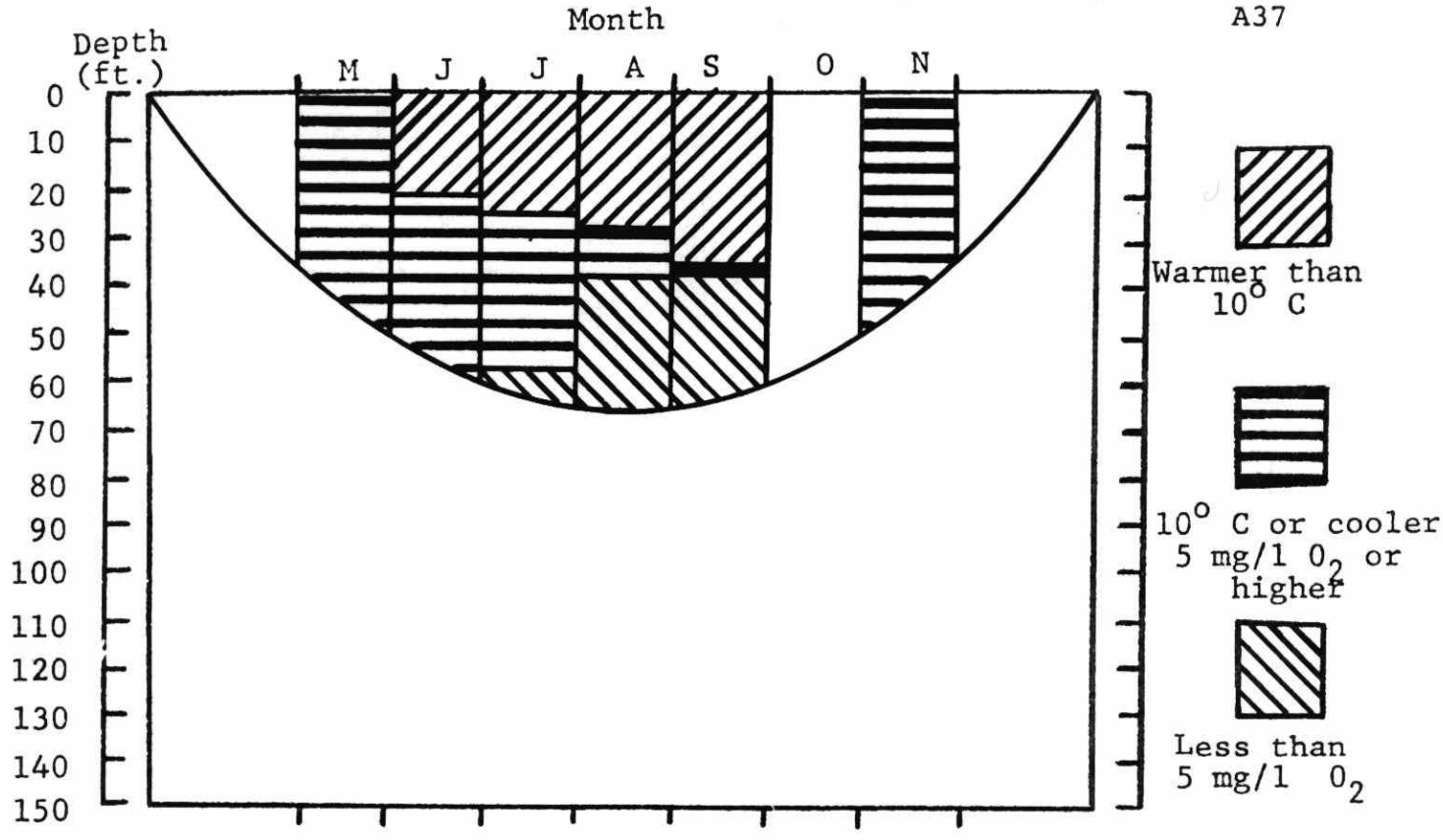
Upstream Lakes	0 lbs.	0%
Land Runoff	17	18
Atmosphere	80	82
Shoreline Develop.	0	0

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
28		5	110	135	12	280	0.05	8.2

Mair Lake supports a population of hatchery stock lake trout. The shoreline of the lake is owned by the Crown and undeveloped. Owing to the lake's small surface area, it could not be sampled by aircraft and only one visit to the lake was made in 1976. The August oxygen profile indicates suitable water quality for lake trout however the oxygen reserve had been severely depleted considering the lake's large deep water volume relative to surface area. Considering the measured oxygen profile and extremely low flushing rate, a high sensitivity to further phosphorus inputs is suggested.



MARBLE LAKE

Morphometry Hydrology

Surface Area	435	acres
Mean Depth	11	feet
Maximum Depth	60	feet
Volume	4,685	acre-feet
Watershed Area	135.3	square miles
Flushing Rate	21.36	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	60
Vacant Lots	7
Tourist Camps	40
Tent, Trailer Sites	120
% Shoreline Crown	7
% Shoreline Patent	93

Estimated Phosphorus Supply (Annual)

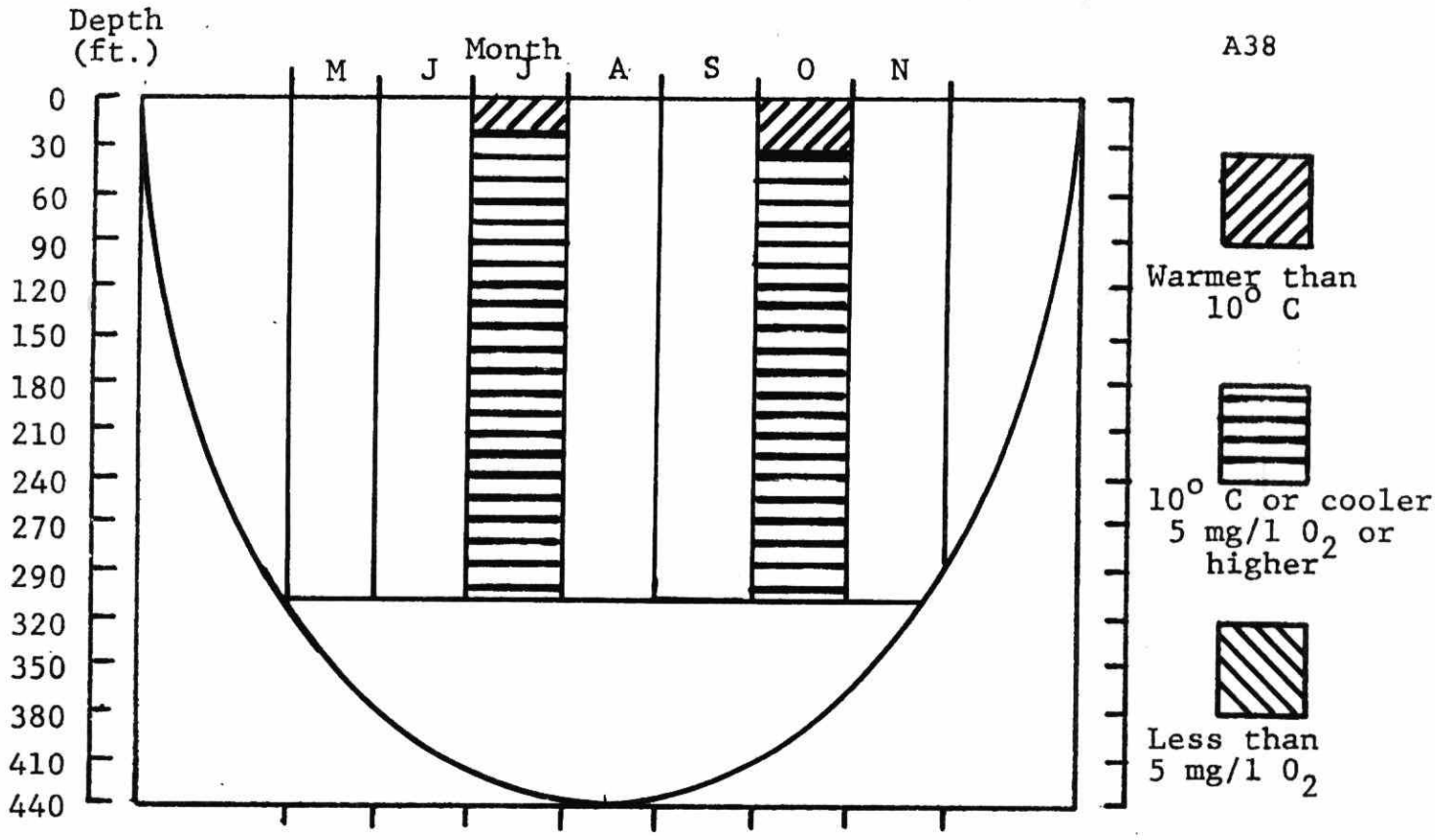
Upstream Lakes	3,822	lbs.	84%
Land Runoff	198		4
Atmosphere	290		6
Shoreline Develop.	249		6

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	present
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	1.1	10	28	60	9	370	0.15	6.6

The 1976 survey of Marble Lake indicated a low level of enrichment at 1.1 ug/l as chlorophyll. For management purposes, the lake trout population of Marble Lake is currently considered to be extinct. The lake has only a small volume of deep water which would be suitable habitat for the species and the survey findings demonstrate that the oxygen conditions would be poor but possibly acceptable for a tolerant strain of lake trout. The lake's rapid flushing rate of 21.4 times per year supports a conclusion that additional shoreline development would not alter the existing oxygen conditions.



MAZINAW LAKE

Morphometry Hydrology

Surface Area	3,930	acres
Mean Depth	135	feet
Maximum Depth	475	feet
Volume	531,029	acre-feet
Watershed Area	91.9	square miles
Flushing Rate	0.16	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	254
Vacant Lots	34
Tourist Camps	47
Tent, Trailer Sites	765
% Shoreline Crown	50
% Shoreline Patent	50

Estimated Phosphorus Supply (Annual)

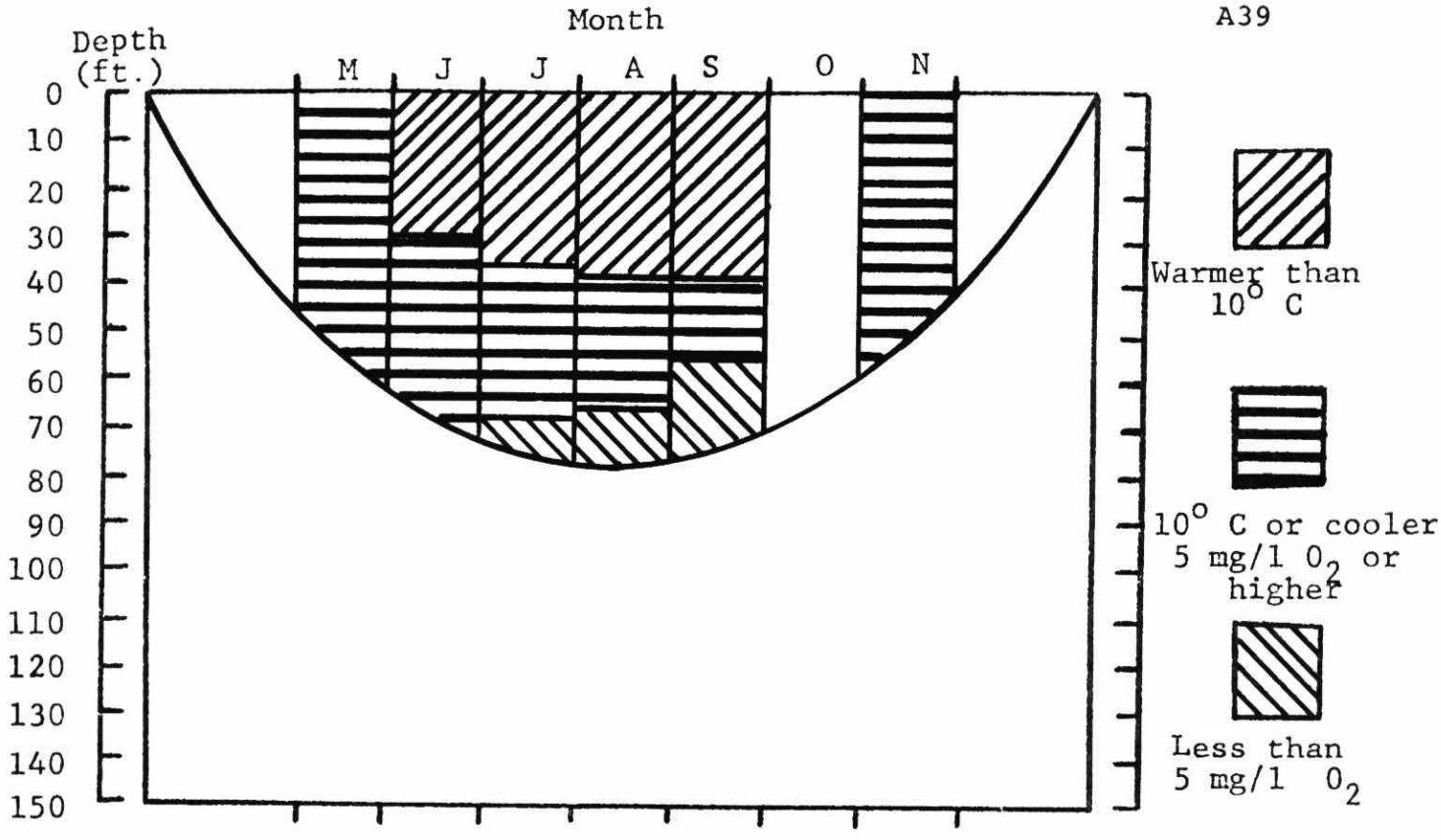
Upstream Lakes	734	lbs.	10%
Land Runoff	2,692		38
Atmosphere	2,630		37
Shoreline Develop.	1,062		15

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	0.9			67	9	270		7.2

Mazinaw Lake supports a native population of naturally reproducing lake trout. The shoreline of the lake supports a fairly high level of development. Based on the results of a 1971 survey of the lake, its enrichment status is low at 0.9 ug/l chlorophyll. Dissolved oxygen measurements were made only to a depth of about 300 feet but revealed excellent water quality for lake trout. The lake is considered to be relatively insensitive to dissolved oxygen depletion resulting from further shoreline development owing to its large volume of deep waters.



MISSISSAGAGON LAKE

Morphometry Hydrology

Surface Area	1,295	acres
Mean Depth	30	feet
Maximum Depth	78	feet
Volume	38,674	acre-feet
Watershed Area	8.2	square miles
Flushing Rate	0.13	times per yr.
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	113
Vacant Lots	7
Tourist Camps	48
Tent, Trailer Sites	12
% Shoreline Crown	27
% Shoreline Patent	73

Estimated Phosphorus Supply (Annual)

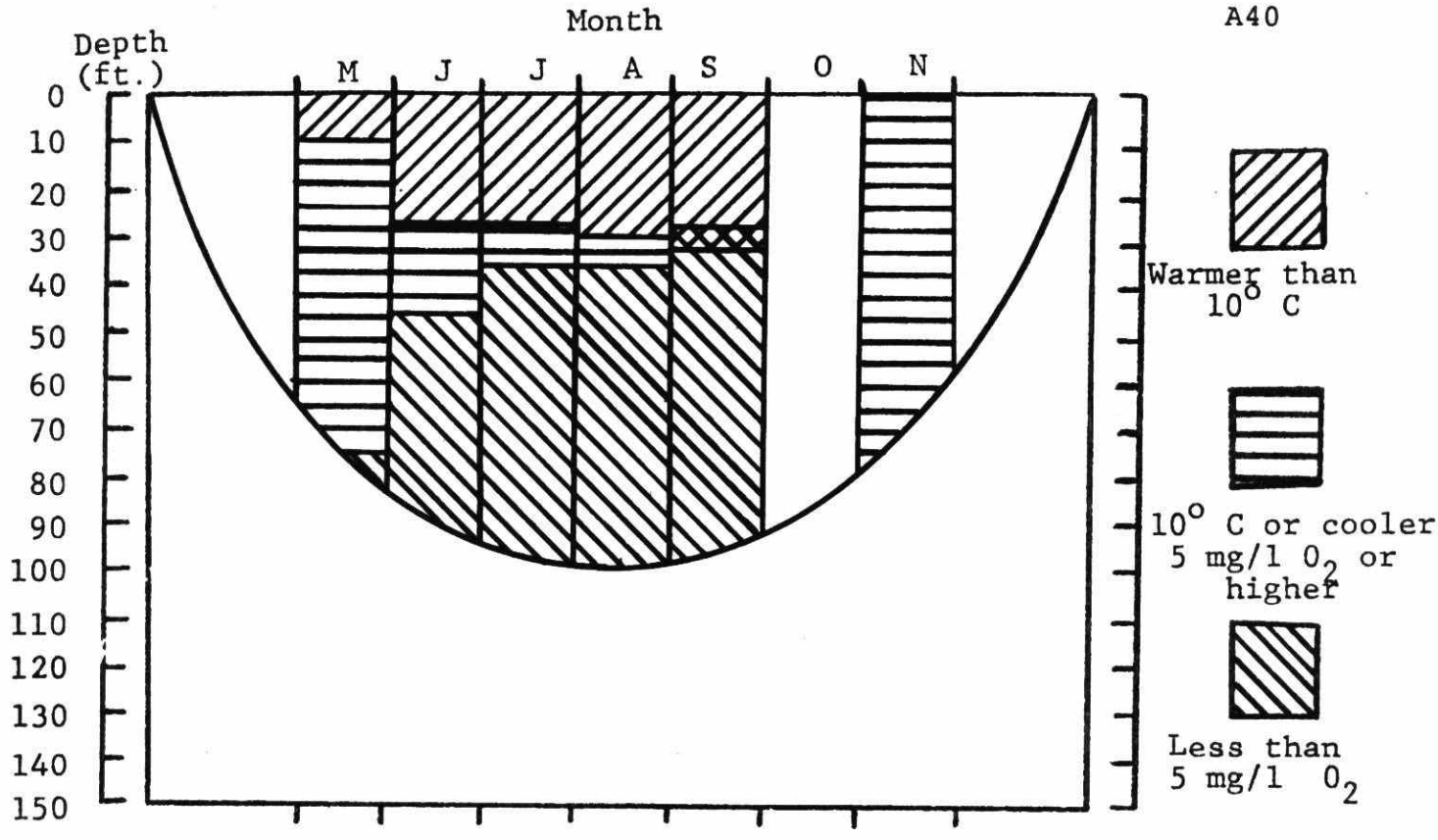
	lbs.	%
Upstream Lakes	6	1%
Land Runoff	318	22
Atmosphere	866	61
Shoreline Develop.	229	16

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18	2.1	7	90	116	11	386	0.25	7.5

Mississagagon Lake is considered for fisheries management purposes to have an extinct lake trout population. The shoreline of the lake has a low to moderate level of development. The 1976 survey revealed a moderate level of enrichment at 2.1 ug/l chlorophyll. The oxygen profiles indicate reasonably good water quality conditions for lake trout and possibly somepotential to re-activate a lake trout fishery. The lake has a relatively small volume of deep water and therefore a moderately high sensitivity to further oxygen depletion resulting from additional shoreline development.



MOSQUE LAKE

Morphometry Hydrology

Surface Area	341	acres
Mean Depth	23	feet
Maximum Depth	112	feet
Volume	7,863	acre-feet
Watershed Area	2.4	square miles
Flushing Rate	0.20	times per year
Water Level Fluct.	1.5	feet

Shoreline Development

Cottages, Homes	35
Vacant Lots	3
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	73
% Shoreline Patent	27

Estimated Phosphorus Supply (Annual)

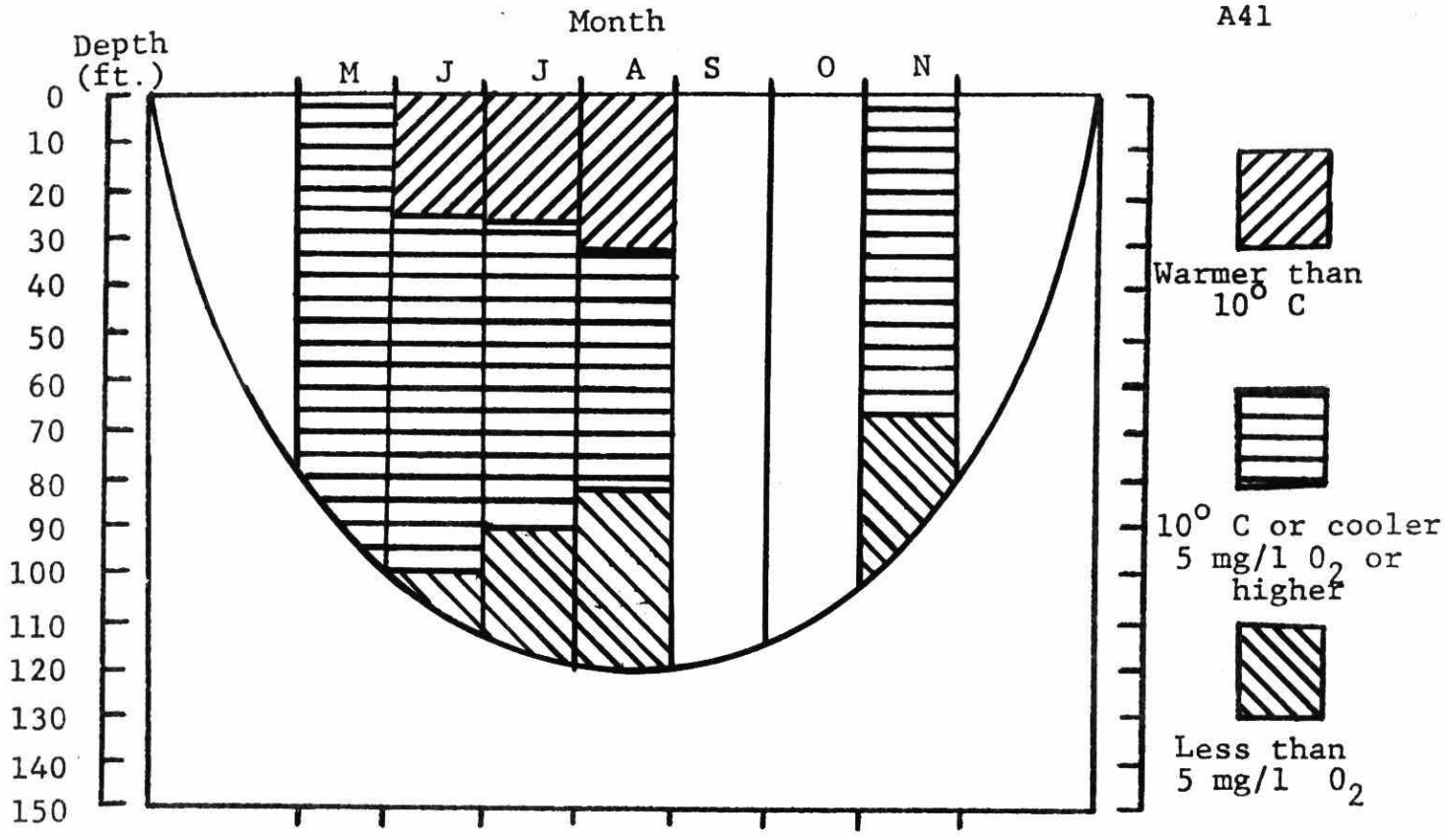
Upstream Lakes	0 lbs.	0%
Land Runoff	59	18
Atmosphere	228	67
Shoreline Develop.	48	14

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
20	1.9	10	36	65	18	352	0.10	7.2

Mosque Lake supports a population of native and hatchery stock lake trout. The shoreline of the lake supports a modest level of development with 35 occupied and 3 vacant lots. The 1976 survey revealed a moderate level of enrichment at 1.9 ug/l chlorophyll. The oxygen profiles indicate poor water quality conditions for lake trout with oxygen and temperature stresses occurring by September. The lake with a mean depth of only 23 feet has a limited volume of deep water and is considered highly sensitive to further phosphorus inputs.



OTTER LAKE

Morphometry Hydrology

Surface Area	1,488	acres
Mean Depth	33	feet
Maximum Depth	120	feet
Volume	49,009	acre - feet
Watershed Area	18.0	square miles
Flushing Rate	0.25	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	290
Vacant Lots	46
Tourist Camps	54
Tent, Trailer Sites	101
% Shoreline Crown	1
% Shoreline Patent	99

Estimated Phosphorus Supply (Annual)

Upstream Lakes	0	lbs.	0%
Land Runoff	1,455		48
Atmosphere	966		33
Shoreline Develop.	562		19

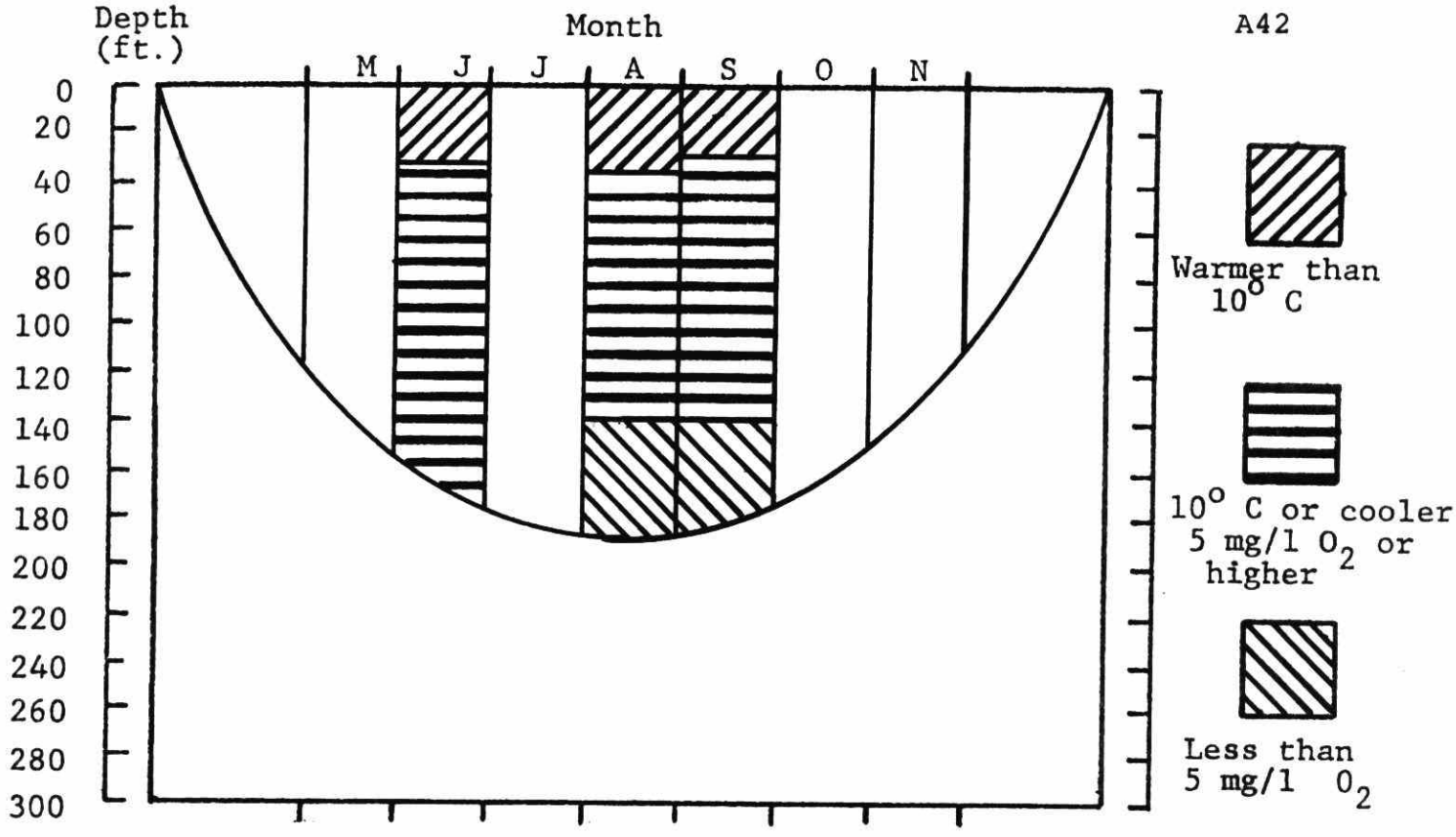
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
12	1.8	5	131	182	15	429	L 0.05	8.2

L = less than

Otter Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake supports a high level of existing and committed development. The 1975 survey of Otter Lake revealed a moderate level of enrichment at 1.8 ug/l chlorophyll. The oxygen profiles indicate good water quality conditions for lake trout. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further oxygen depletion resulting from additional shoreline development.



PALMERSTON LAKE

Morphometry Hydrology

Surface Area	1,391	acres
Mean Depth	68	feet
Maximum Depth	185	feet
Volume	94,000	acre-feet
Watershed Area	18.0	square miles
Flushing Rate	0.13	times per yr.
Water Level Fluct.	1.0	feet

Shoreline Development

Cottages, Homes	103
Vacant Lots	
Tourist Camps	14
Tent, Trailer Sites	100
% Shoreline Crown	15
% Shoreline Patent	85

Estimated Phosphorus Supply (Annual)

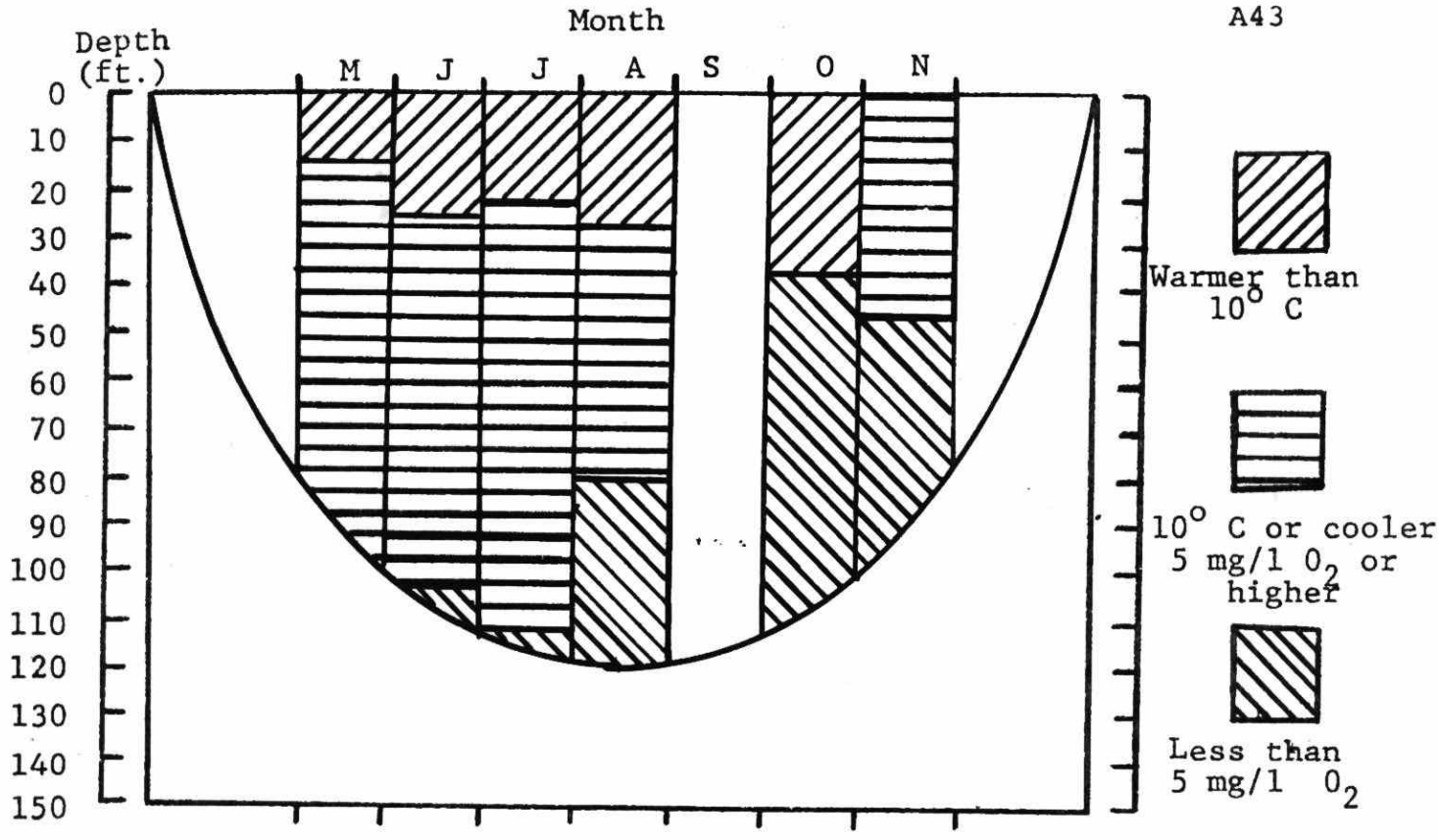
Upstream Lakes	0 lbs.	0%
Land Runoff	497	30
Atmosphere	931	56
Shoreline Develop.	248	14

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
26	1.0		79	117	18	462	0.5	

Palmerston Lake supports a native population of naturally reproducing lake trout. Approximately 85 percent of the shoreline of the lake is in private ownership. Based on the results of a 1973 survey of the lake, it has a low level of enrichment at 1.0 ug/l chlorophyll. The oxygen profiles indicate excellent water quality for lake trout. The lake is considered to be relatively insensitive to further phosphorus inputs owing to its large volume of deep waters.



REDHORSE LAKE

Morphometry Hydrology

Surface Area	413	acres
Mean Depth	34	feet
Maximum Depth	121	feet
Volume	24,968	acre-feet
Watershed Area	127.4	square miles
Flushing Rate		times per year
Water Level Fluct.	3.0	feet

Shoreline Development

Cottages, Homes	18
Vacant Lots	14
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

Upstream Lakes	4,825 lbs.	89%
Land Runoff	282	5
Atmosphere	276	5
Shoreline Develop.	24	1

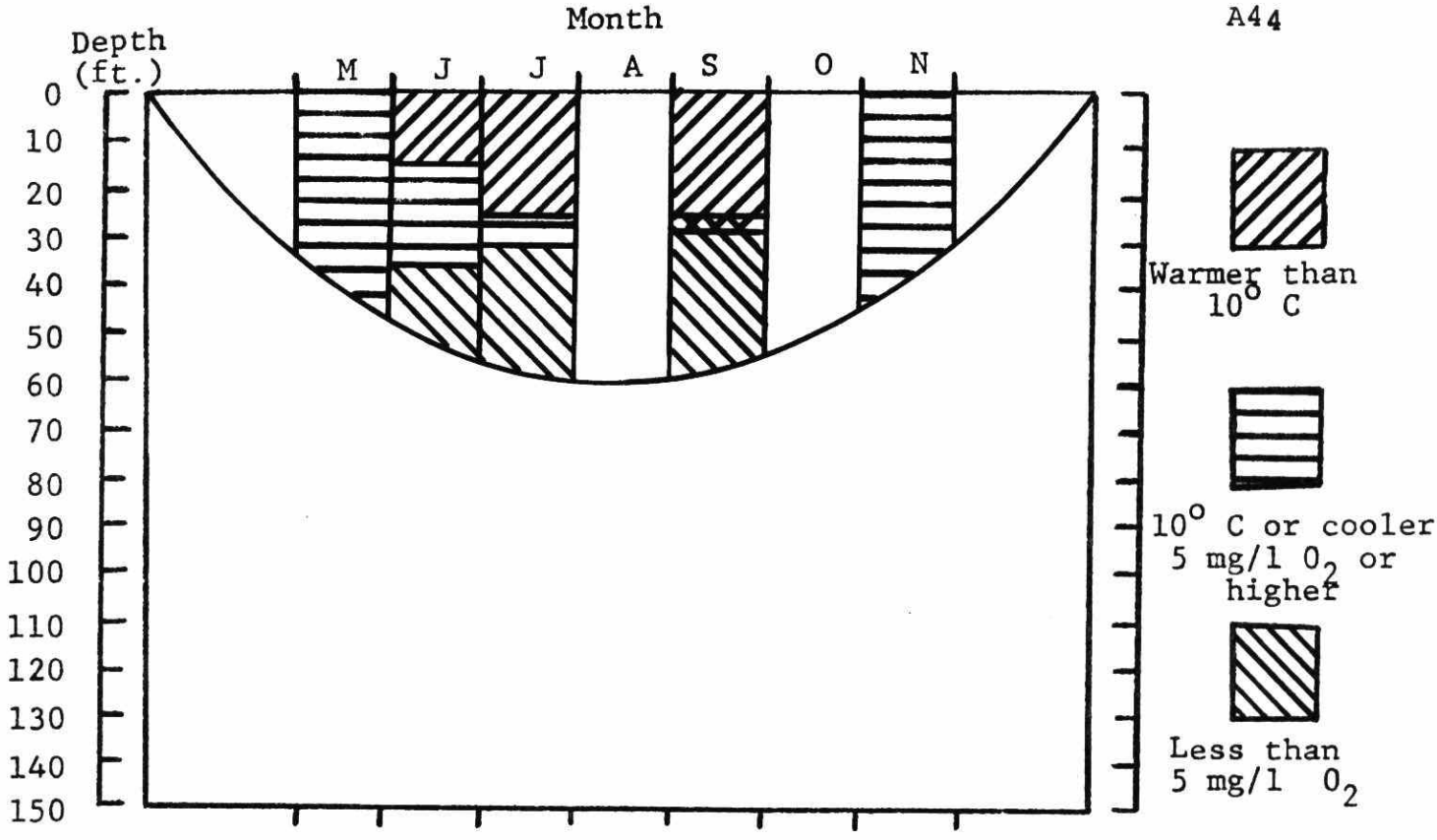
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
12	4.0	12	118	164	25	486	L 0.05	8.5

L = less than

Redhorse Lake supports a native population of naturally reproducing lake trout. The shoreline of the lake is only sparsely developed. The 1975 survey of Redhorse Lake revealed a high level of enrichment at 4.0 ug/l chlorophyll. The oxygen profiles indicate poor water quality for lake trout by mid-fall. The lake is situated on the Gananoque River and experiences rapid flushing and also obtains most of its phosphorus supply from upstream lakes. For these reasons, the oxygen resource of Redhorse Lake is considered to be insensitive to depletion from further shoreline development.



REID LAKE

Morphometry Hydrology

Surface Area	255	acres
Mean Depth	25	feet
Maximum Depth	65	feet
Volume	6,266	acre-feet
Watershed Area	2.6	square miles
Flushing Rate	0.29	times per year
Water Level Fluct.	1.0	feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

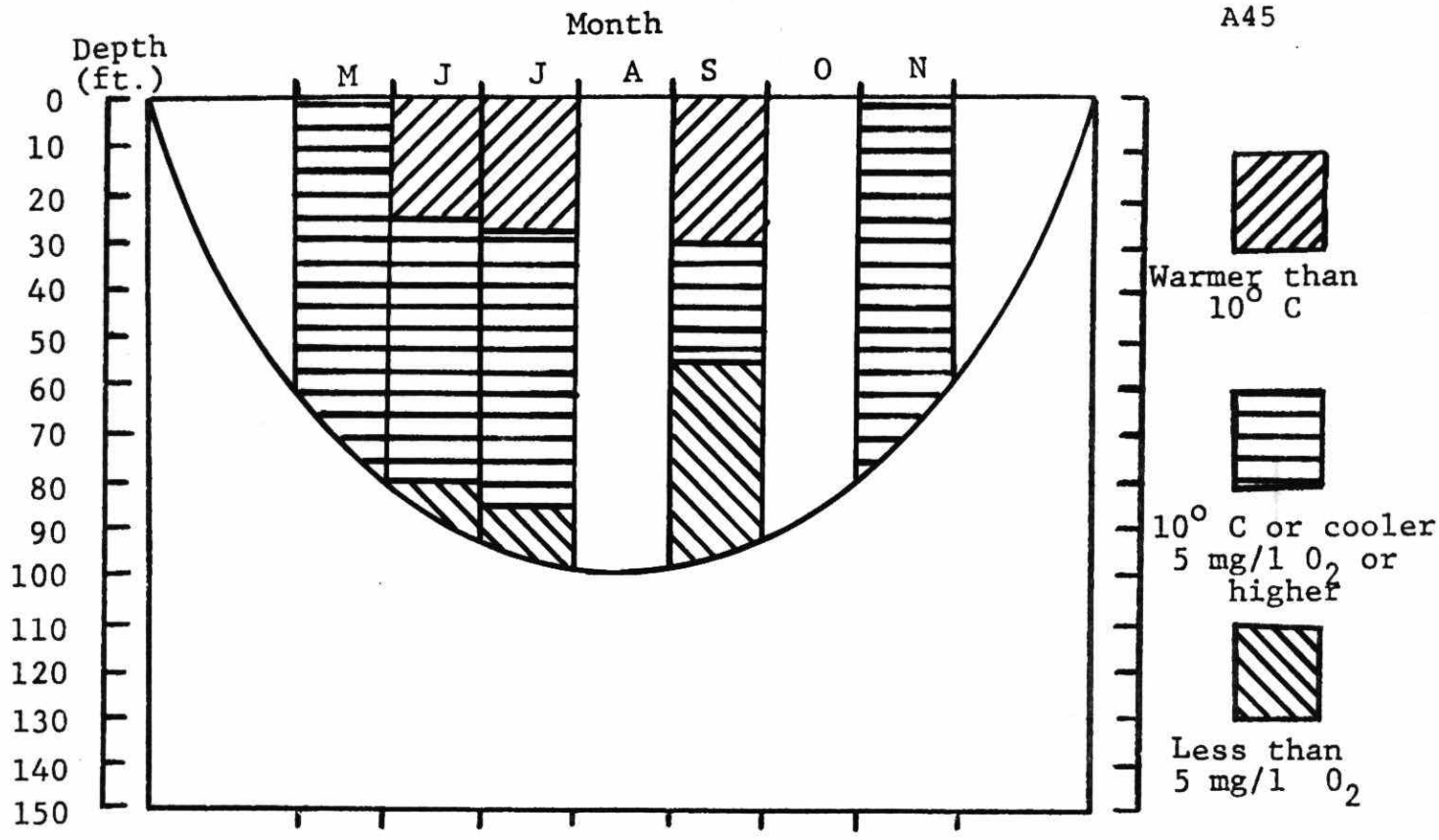
Upstream Lakes	0 lbs.	0%
Land Runoff	70	29
Atmosphere	170	71
Shoreline Develop.	0	0

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
19	1.6	8	14	35	13	380	0.25	6.4

Reid Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is undeveloped and owned by the Crown. The 1976 survey revealed a fairly low level of enrichment at 1.6 ug/l chlorophyll. The oxygen profiles for the lake indicate poor water quality for lake trout with oxygen and temperature stresses occurring in September. Based on the existing oxygen conditions and the lake's shallow depth and small deep water volume, Reid Lake is considered to be highly sensitive to further phosphorus inputs.



ROUND SCHOONER LAKE

Morphometry Hydrology

Surface Area	474	acres
Mean Depth	50	feet
Maximum Depth	105	feet
Volume	23,678	acre - feet
Watershed Area	1.9	square miles
Flushing Rate	0.89	times per year
Water Level Fluct.	2.0	feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	100
% Shoreline Patent	0

Estimated Phosphorus Supply (Annual)

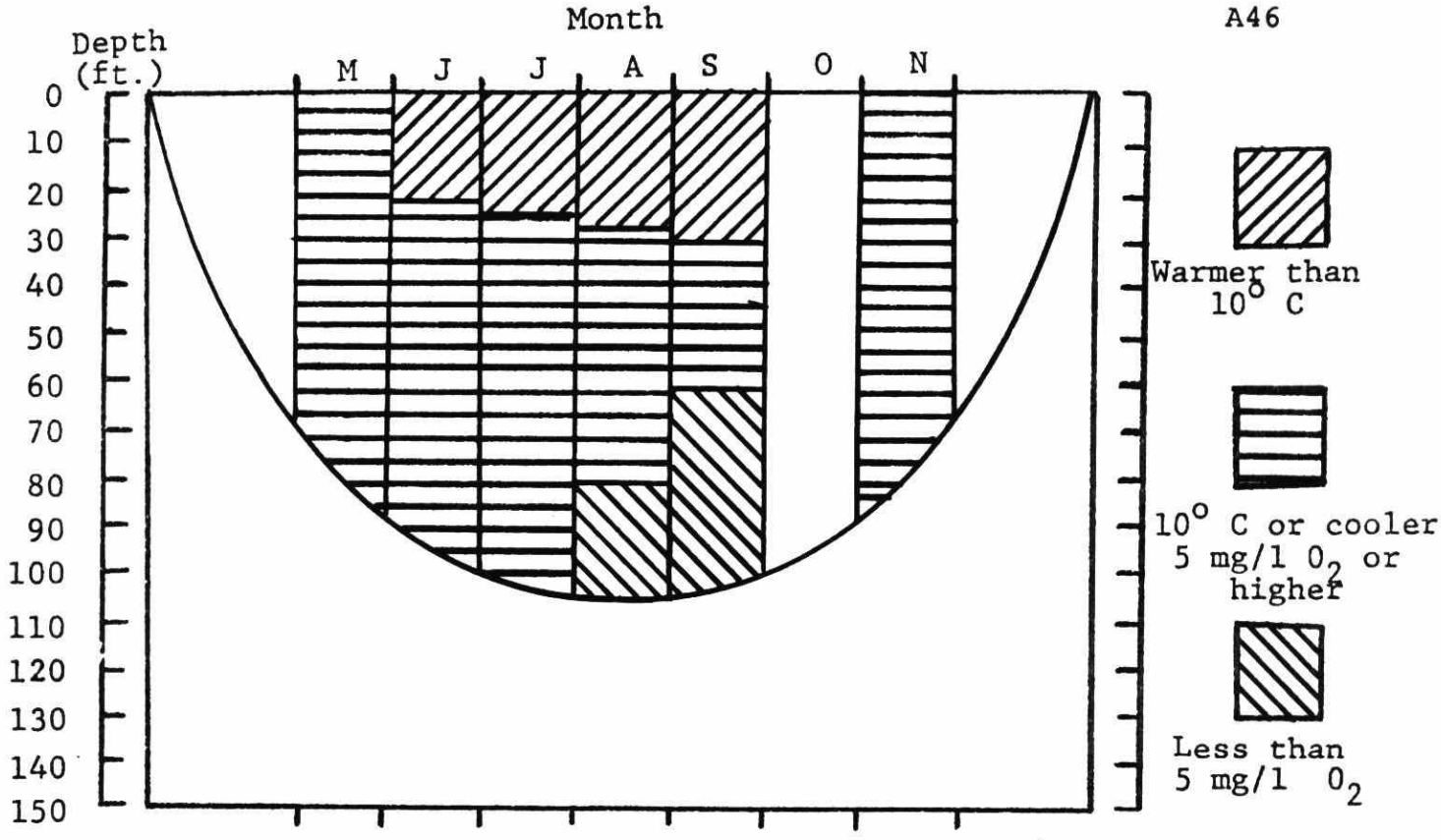
Upstream lakes	464 lbs.	57%
Land Runoff	37	5
Atmosphere	318	38
Shoreline Develop.	0	0

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
20	2.1	10	44	68	10	298	0.05	7.2

Round Schooner Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is undeveloped. The 1976 survey of Round Schooner Lake revealed a moderate level of enrichment at 2.1 ug/l chlorophyll. The oxygen profiles demonstrate good water quality conditions for lake trout. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further dissolved oxygen depletion resulting from additional shoreline development.



SHABOMEKA LAKE

Morphometry Hydrology

Surface Area	622	acres
Mean Depth	41	feet
Maximum Depth	105	feet
Volume	26,904	acre-feet
Watershed Area	15.8	square miles
Flushing Rate	0.43	times per yr.
Water Level Fluct.	2.0	feet

Shoreline Development

Cottages, Homes	74
Vacant Lots	13
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	60
% Shoreline Patent	40

Estimated Phosphorus Supply (Annual)

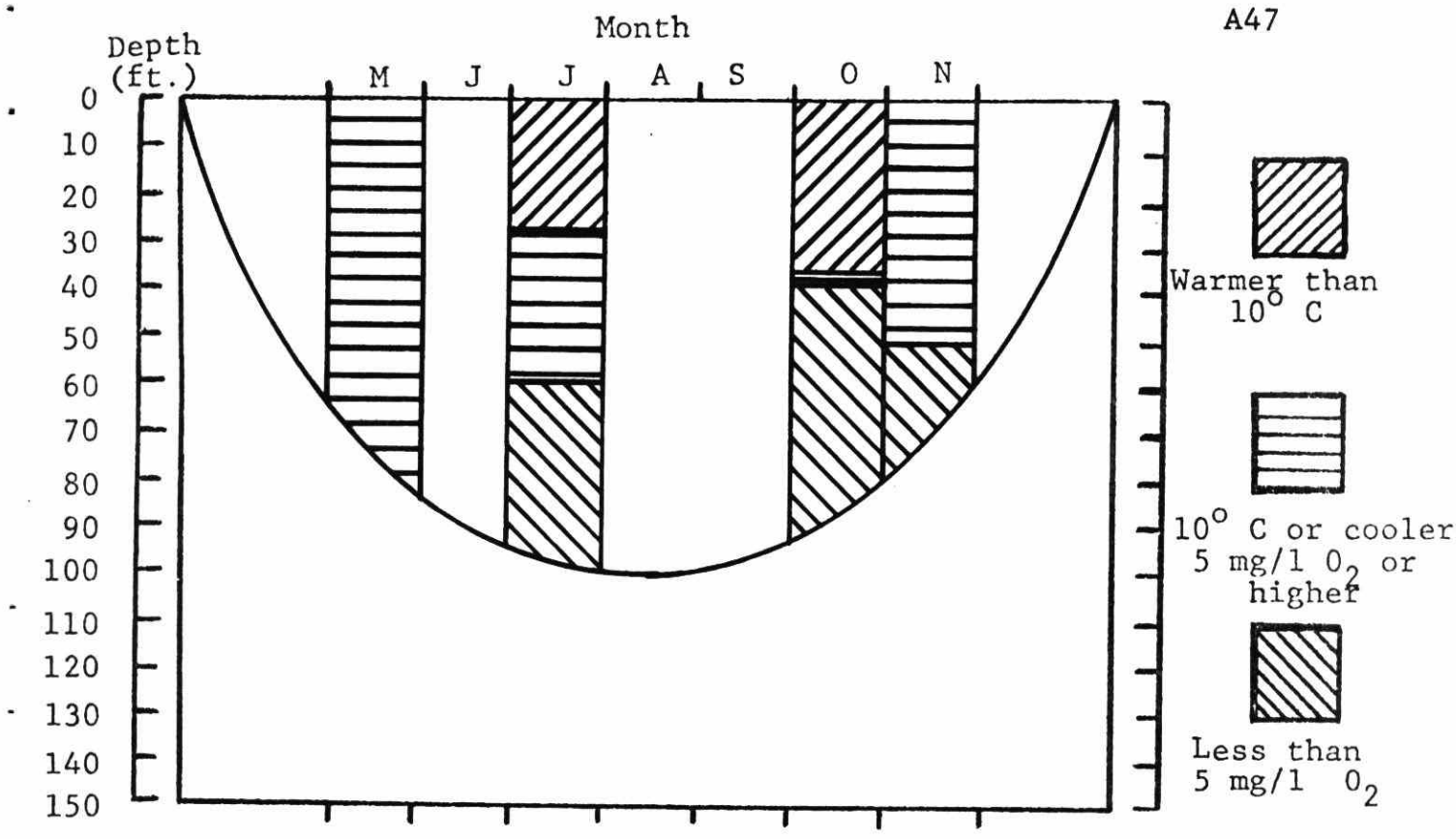
Upstream Lakes	201 lbs.	23%
Land Runoff	116	14
Atmosphere	442	51
Shoreline Develop.	100	12

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	1.8	8	29	52	9	332	0.08	6.7

Shabomeka Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake supports 74 developed lots. The 1976 survey of Shabomeka Lake revealed a moderate level of enrichment at 1.8 ug/l chlorophyll. The oxygen profiles demonstrate good water quality conditions for lake trout. The lake has a moderately large volume of deep water and is considered to have a correspondingly moderate sensitivity to further oxygen depletion resulting from additional shoreline development.



SHARBOT LAKE - WESTERN BASIN

Morphometry Hydrology

Surface Area	1,690	acres
Mean Depth	26.5	feet
Max. Depth	102	feet
Volume	44,845	acre - feet
Watershed Area	34.08	sq. miles
Flushing Rate	0.56	times per yr.
Water Level Fluct.		feet

Shoreline Development

Cottagers, Homes	75 (1970)
vacant lots	81
tourist camps	3 (32)
tent, trailer sites	
% shoreline crown	5

Estimated Phosphorus Supply (Annual)

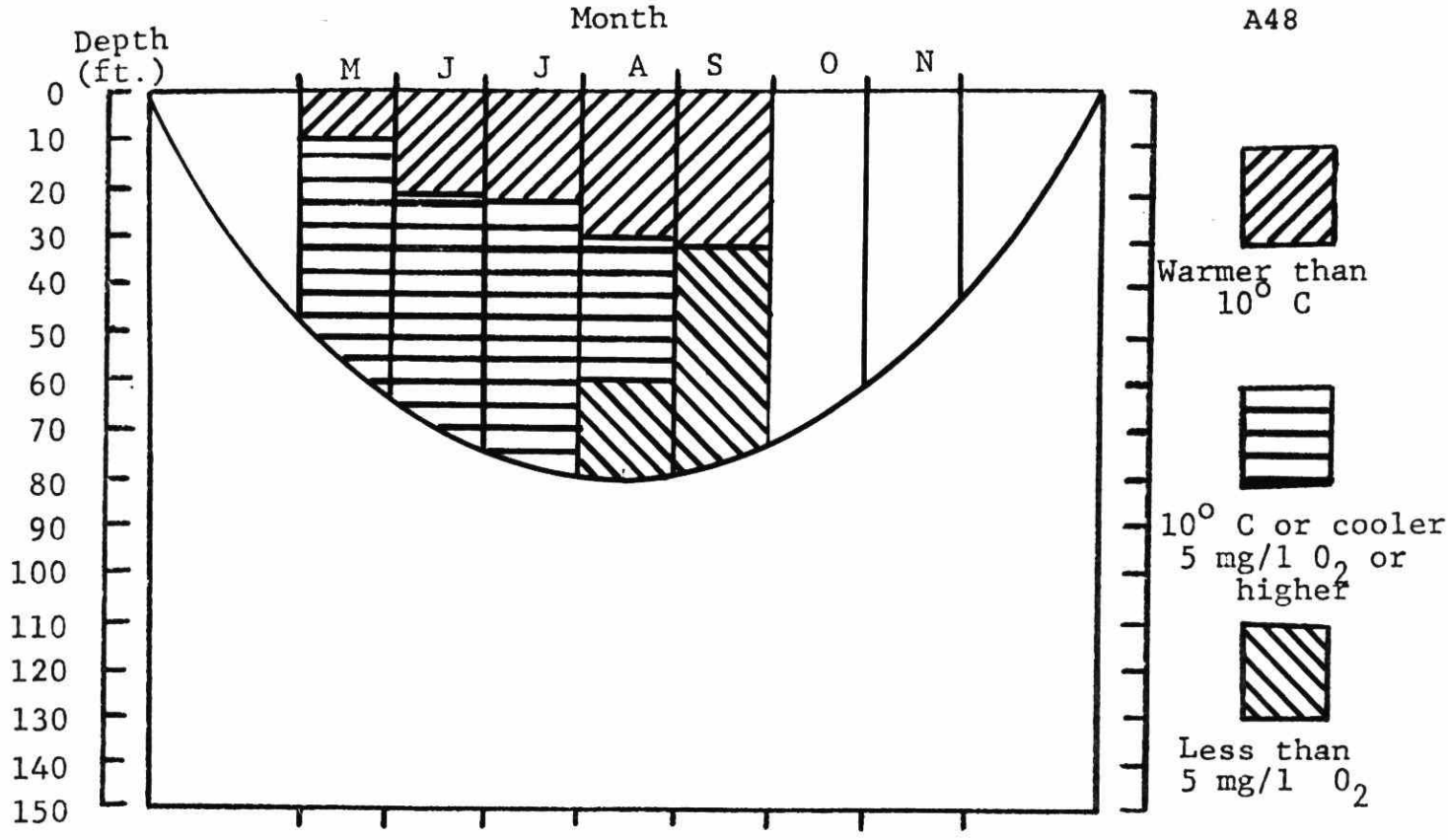
Upstream lakes	165 lbs.	6 %
Land runoff	1,247	44
Atmosphere	1,128	39
Shoreline develop.	330	11

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	Not detected
Lake Herring	Not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P. ug/l	Total N ug/l	Iron mg/l	pH
14.4	2.7	10	84	138	16	425		7.8

The Western Basin of Sharbot Lake supports a population of native and naturally reproducing lake trout. Most of the shoreline is in private ownership. The 1975 survey revealed a moderate level of enrichment at 2.7 ug/l chlorophyll. The dissolved oxygen profiles indicate a highly confined zone of preferred lake trout water quality conditions. The Basin is considered to be highly sensitive to further phosphours inputs owing to its limited volume of deep waters. Considering this factor and the large number of vacant lots which exist (81), additional shoreline development would be inadvisable.



SILVER LAKE

Morphometry Hydrology

Surface Area	608	acres
Mean Depth	34	feet
Maximum Depth	80	feet
Volume	20,192	acre-feet
Watershed Area	11.5	square miles
Flushing Rate	0.42	times per year
Water Level Fluct.	1.0	feet

Shoreline Development

Cottages, Homes	95
Vacant Lots	14
Tourist Camps	14
Tent, Trailer Sites	172
% Shoreline Crown	10
% Shoreline Patent	90

Estimated Phosphorus Supply (Annual)

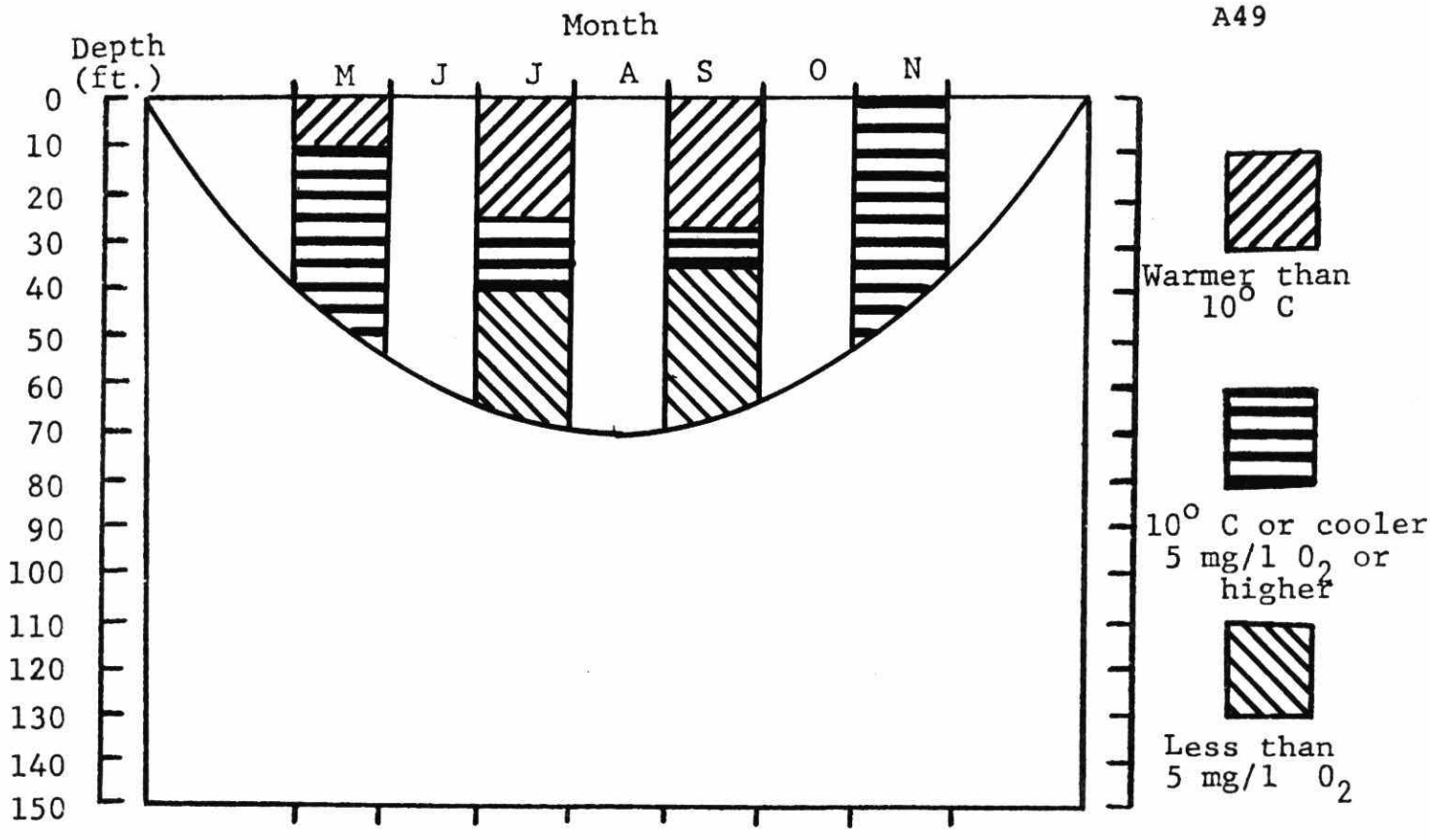
Upstream Lakes	0 lbs.	0%
Land Runoff	589	46
Atmosphere	408	31
Shoreline Develop.	300	23

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
12	1.2	7	113	174	24	461	0.10	8.8

Silver Lake supports a population of hatchery stock lake trout. Approximately 90 percent of the lake's shoreline is in private ownership and already supports a moderate to high level of development. A major development proposal involving Silver Lake is being reviewed at the present time by the Ministry of Housing. The 1975 survey demonstrated a low level of enrichment at 1.2 ug/l chlorophyll however the September oxygen profile reveals stress conditions for lake trout. Based on the existing oxygen conditions within Silver Lake and the lake's shallow depth and limited deep water volume, further phosphorus inputs would be inadvisable.



TANGAMONG LAKE - TROUTING BAY

Morphometry Hydrology

Surface Area	188	acres
Mean Depth		feet
Maximum Depth	75	feet
Volume		acre - feet
Watershed Area	5.8	square miles
Flushing Rate		times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	15
Vacant Lots	2
Tourist Camps	7
Tent, Trailer Sites	0
% Shoreline Crown	30
% Shoreline Patent	70

Estimated Phosphorus Supply (Annual)

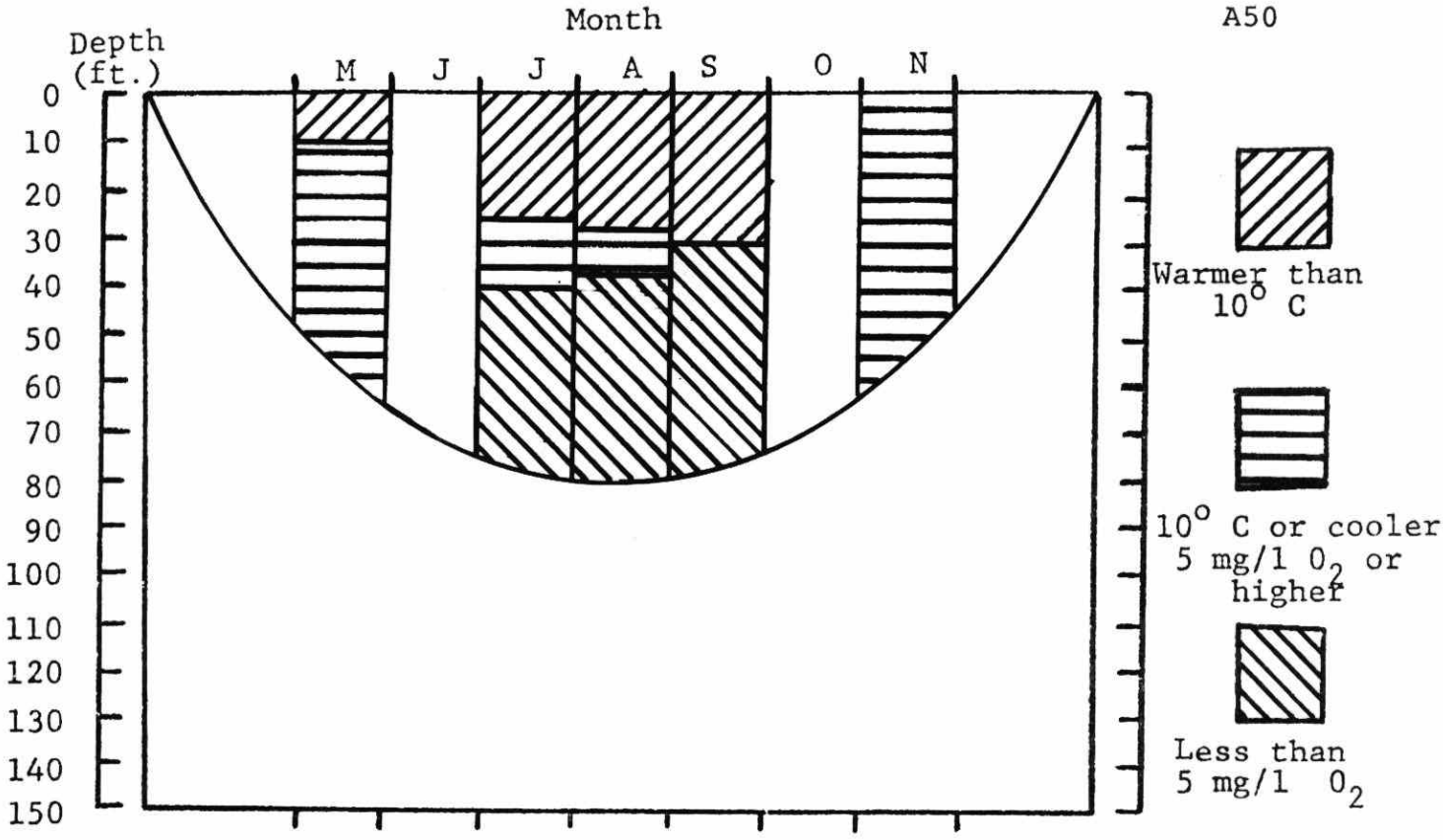
Upstream Lakes	0	lbs.	0%
Land Runoff	326		68
Atmosphere	125		26
Shoreline Develop.	30		6

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
19	4.3	20	36	60	10	376	0.05	6.9

Tangamong Lake (Trouting Bay) is considered for fisheries management purposes to have an extinct lake trout population. The shoreline of the lake is only sparsely developed. The 1976 survey revealed a high level of enrichment at 4.3 ug/l chlorophyll. The oxygen profiles indicate suitable water quality conditions to support lake trout and a possibility of re-activating a fishery. Based on the lake's shallow depth and high level of enrichment it is difficult to explain the measured oxygen conditions. As an interim measure, it is suggested that the lake's oxygen resource be considered moderately sensitive to depletion resulting from further shoreline development.



THANET LAKE

Morphometry Hydrology

Surface Area	299	acres
Mean Depth	24	feet
Maximum Depth	80	feet
Volume	6,696	acre-feet
Watershed Area	1.1	square miles
Flushing Rate	0.26	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	3
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	60
% Shoreline Patent	40

Estimated Phosphorus Supply (Annual)

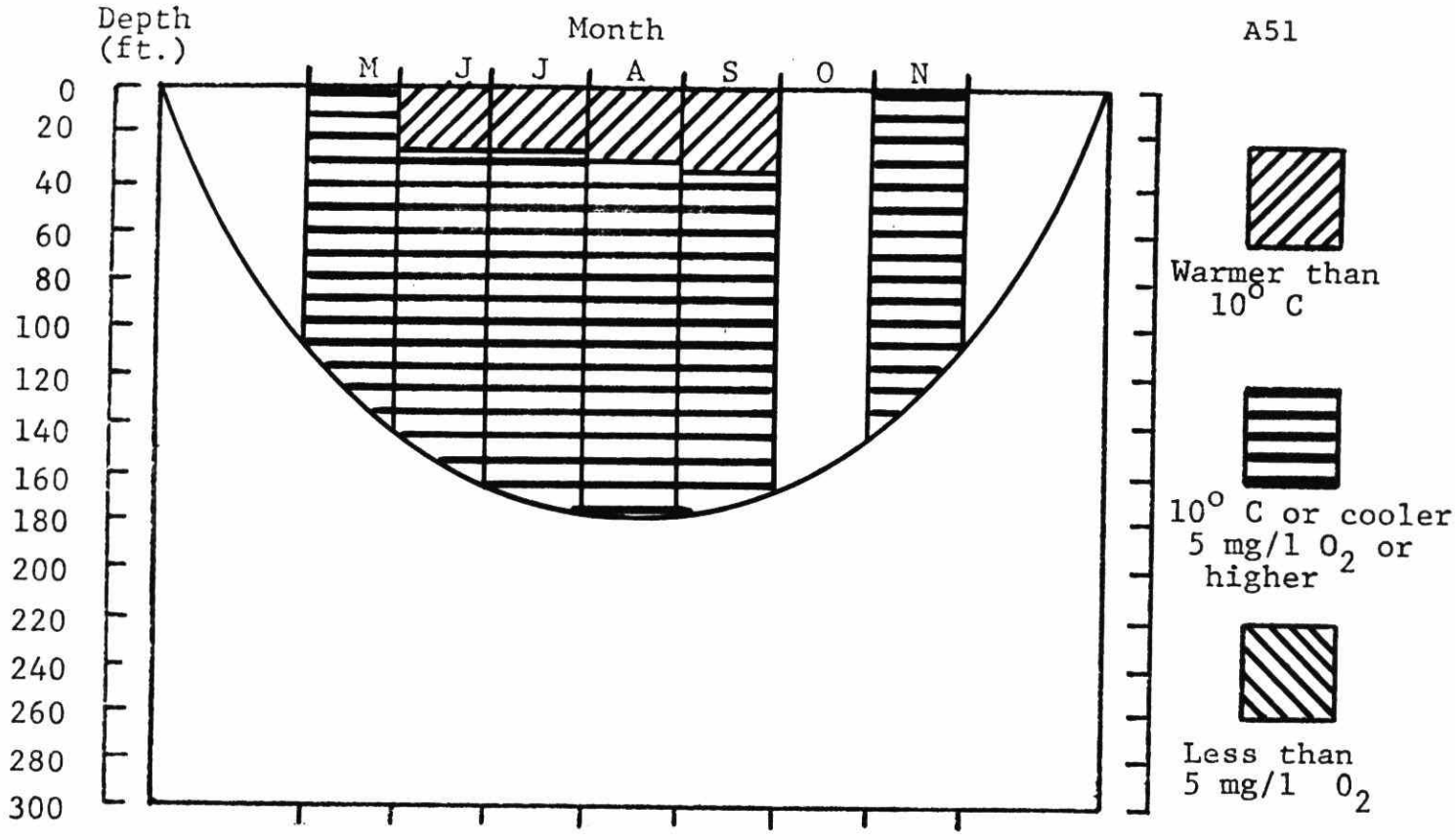
		lbs.	%
Upstream Lakes	18		8%
Land Runoff	26		11
Atmosphere	187		79
Shoreline Develop.	4		2

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
21	1.6	13	55	77	13	398	0.08	7.1

Thanet Lake supports a population of native and naturally reproducing lake trout. The shoreline of the lake is currently undeveloped however a major development proposal involving Thanet Lake is being considered for approval by the Ministry of Housing. The 1976 survey revealed a fairly low level of enrichment at 1.6 ug/l chlorophyll. The dissolved oxygen profiles for the lake indicate poor water quality for lake trout with temperature and oxygen stresses occurring by September. The lake is shallow in depth with only a limited volume of deep water and therefore considered to be highly sensitive to further phosphorus inputs.



WENSLEY LAKE

Morphometry Hydrology

Surface Area	1,411	acres
Mean Depth	73	feet
Maximum Depth	185	feet
Volume	102,662	acre-feet
Watershed Area	20.4	square miles
Flushing Rate	0.14	times per yr.
Water Level. Fluct.	2.0	feet

Shoreline Development

Cottages, Homes	85
Vacant Lots	11
Tourist Camps	32
Tent, Trailer Sites	0
% Shoreline Crown	35
% Shoreline Patent	65

Estimated Phosphorus Supply (Annual)

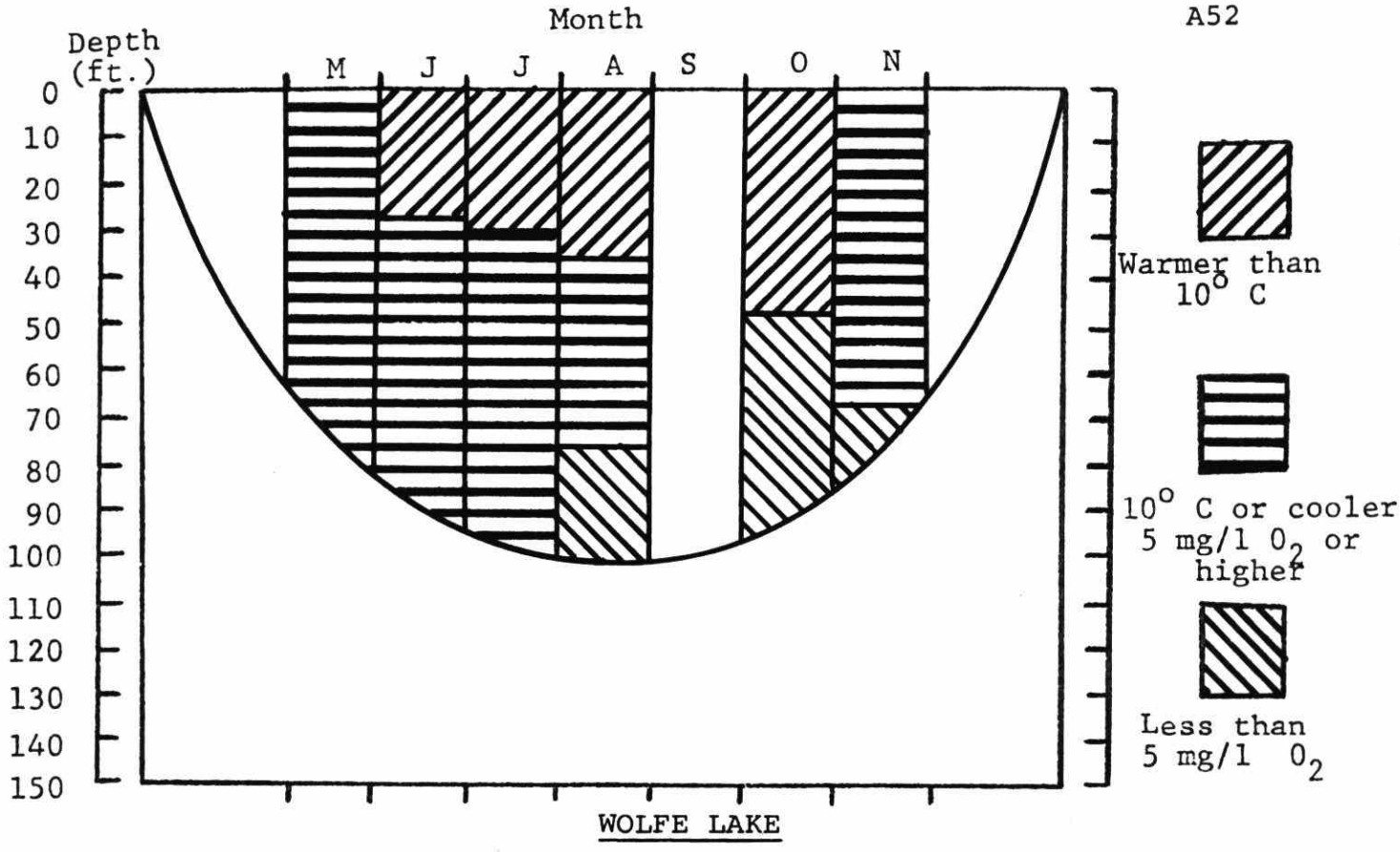
Upstream Lakes	47 lbs.	3%
Land Runoff	469	29
Atmosphere	944	59
Shoreline Develop.	139	9

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
26	1.6	5	43	77	11	372	0.05	7.3

Wensley Lake supports a population of native and naturally reproducing lake trout. Considering the size of the lake, its shoreline has only a low level of development. The 1976 survey of Wensley Lake revealed a moderate level of enrichment at 1.6 ug/l chlorophyll. The oxygen profiles indicate excellent water quality conditions for lake trout. Based on the lake's large volume of deep water, its oxygen resource is considered to be insensitive to depletion resulting from further shoreline development.



WOLFE LAKE

Morphometry Hydrology

Surface Area	2,357	acres
Mean Depth	34	feet
Maximum Depth	102	feet
Volume	80,792	acre-feet
Watershed Area	29.3	square miles
Flushing Rate	0.25	times per yr.
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	120
Vacant Lots	18
Tourist Camps	39
Tent, Trailer Sites	8
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

Upstream Lakes	62	lbs.	2%
Land Runoff	1,329		41
Atmosphere	1,579		49
Shoreline Develop.	234		8

Indicator Food Organisms

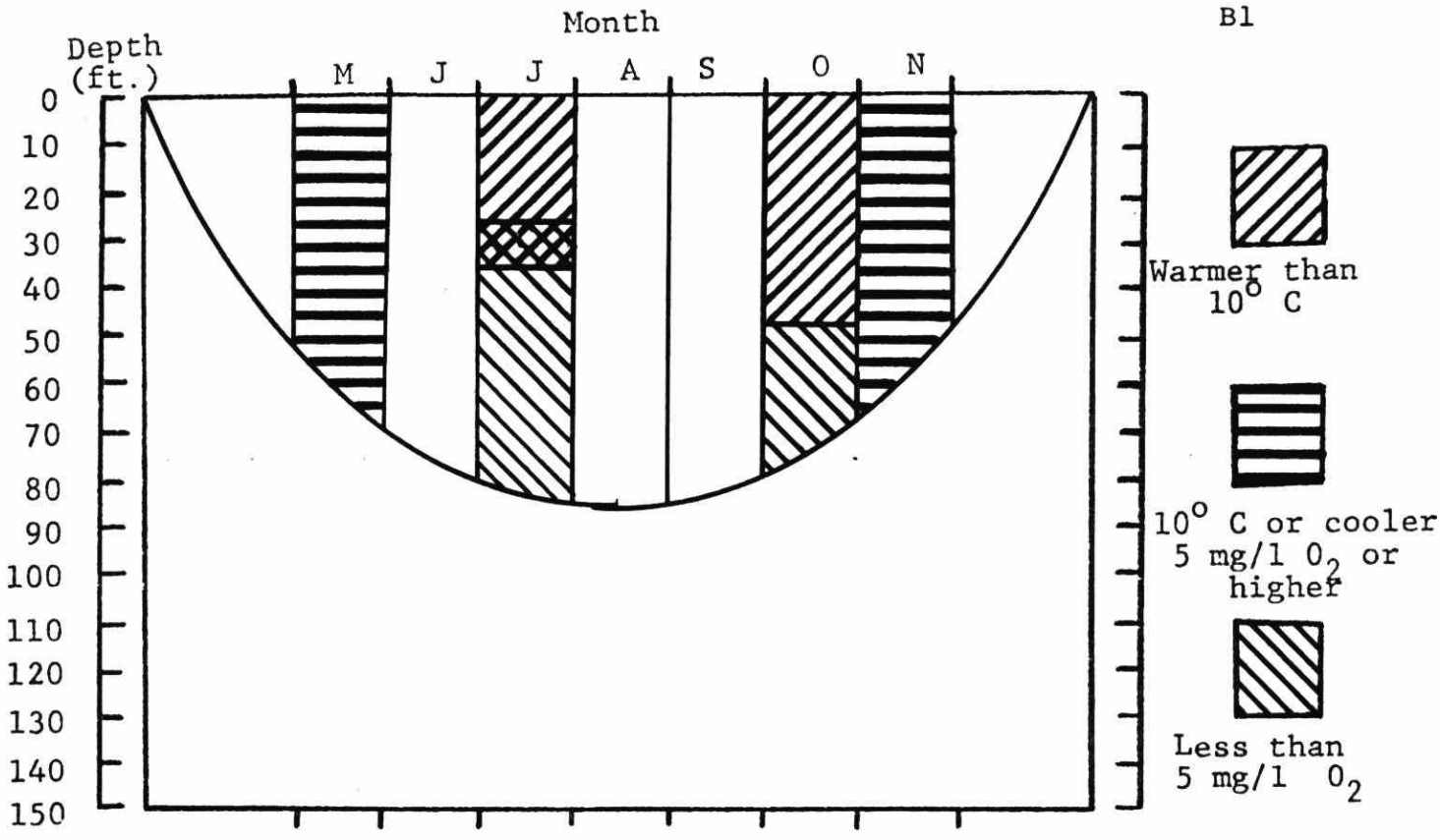
Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18	1.8	5	90	139	17	398	0.10	8.1

Wolfe Lake once supported a native but now extinct population of lake trout. The 1975 survey revealed a moderate level of enrichment at 1.8 ug/l chlorophyll. The oxygen profiles indicate generally suitable water quality conditions for lake trout with stress of a brief duration evident in October. In order to permit Natural Resources staff an opportunity to re-examine the lake trout management potential of Wolfe Lake, it is suggested that precautions should be taken to minimize nutrient inputs from any additional shoreline development which might occur.

APPENDIX B

For purpose of information only, Appendix B provides individual data summary sheets for several lakes which were studied as part of the MOE/MNR Lakes Survey Program. These lakes, according to historical information formerly contained lake trout. Based on the survey findings, water quality conditions in these waters are not suitable to permit lake trout survival. Appropriate water quality management guidelines for these lakes will be provided in a separate report to be prepared which will deal with some of the Region's non-lake trout waters.



CLARENDON LAKE

Morphometry Hydrology

Surface Area	5,832	acres
Mean Depth	13	feet
Maximum Depth	85	feet
Volume	80,382	acre-feet
Watershed Area	52.9	square miles
Flushing Rate	0.48	times per yr.
Water Level Fluct.	2.0	feet

Shoreline Development

Cottages, Homes	280
Vacant Lots	36
Tourist Camps	119
Tent, Trailer Sites	37
% Shoreline Crown	80
% Shoreline Patent	20

Estimated Phosphorus Supply (Annual)

Upstream Lakes	49	lbs.	1%
Land Runoff	2,319		34
Atmosphere	3,909		57
Shoreline Develop.	575		8

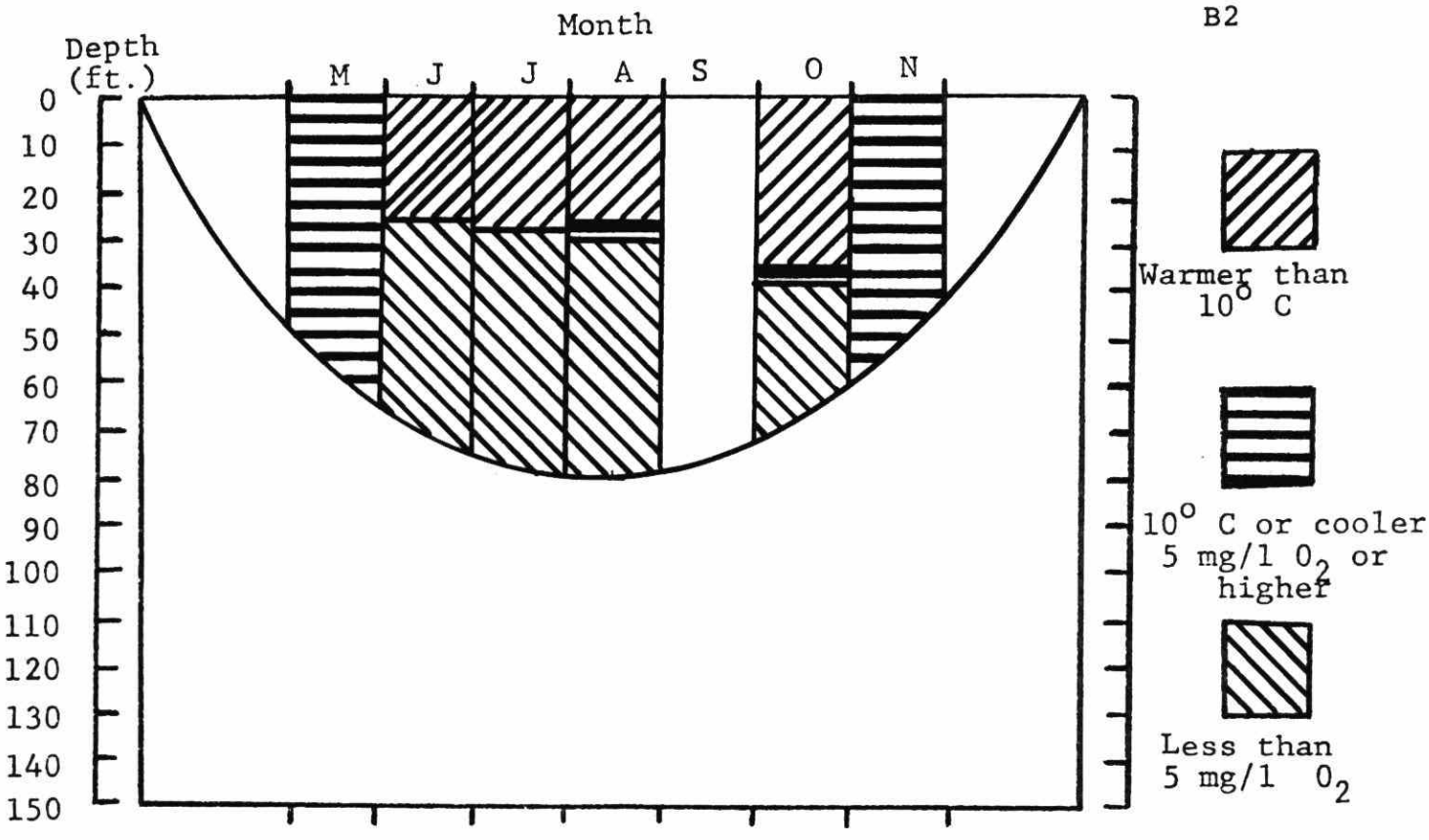
Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	present
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
7	2.5	25	30	49	48	594	L 0.05	7.7

L = less than

Clarendon Lake reportedly once supported a native and now extinct population of lake trout. The 1975 survey revealed a moderately high level of enrichment at 2.5 ug/l chlorophyll and oxygen conditions unsuitable for lake trout survival.



CROSS (CROTCH) LAKE

Morphometry Hydrology

Surface Area	1,495	acres
Mean Depth	24	feet
Maximum Depth	66	feet
Volume	36,834	acre-feet
Watershed Area	339.4	square miles
Flushing Rate	7.42	times per year
Water Level Fluct.	6.0	feet

Shoreline Development

Cottages, Homes	0
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	95
% Shoreline Patent	5

Estimated Phosphorus Supply (Annual)

Upstream Lakes	2,317	lbs.	29%
Land Runoff	4,680		59
Atmosphere	1,001		12
Shoreline Develop.	0		0

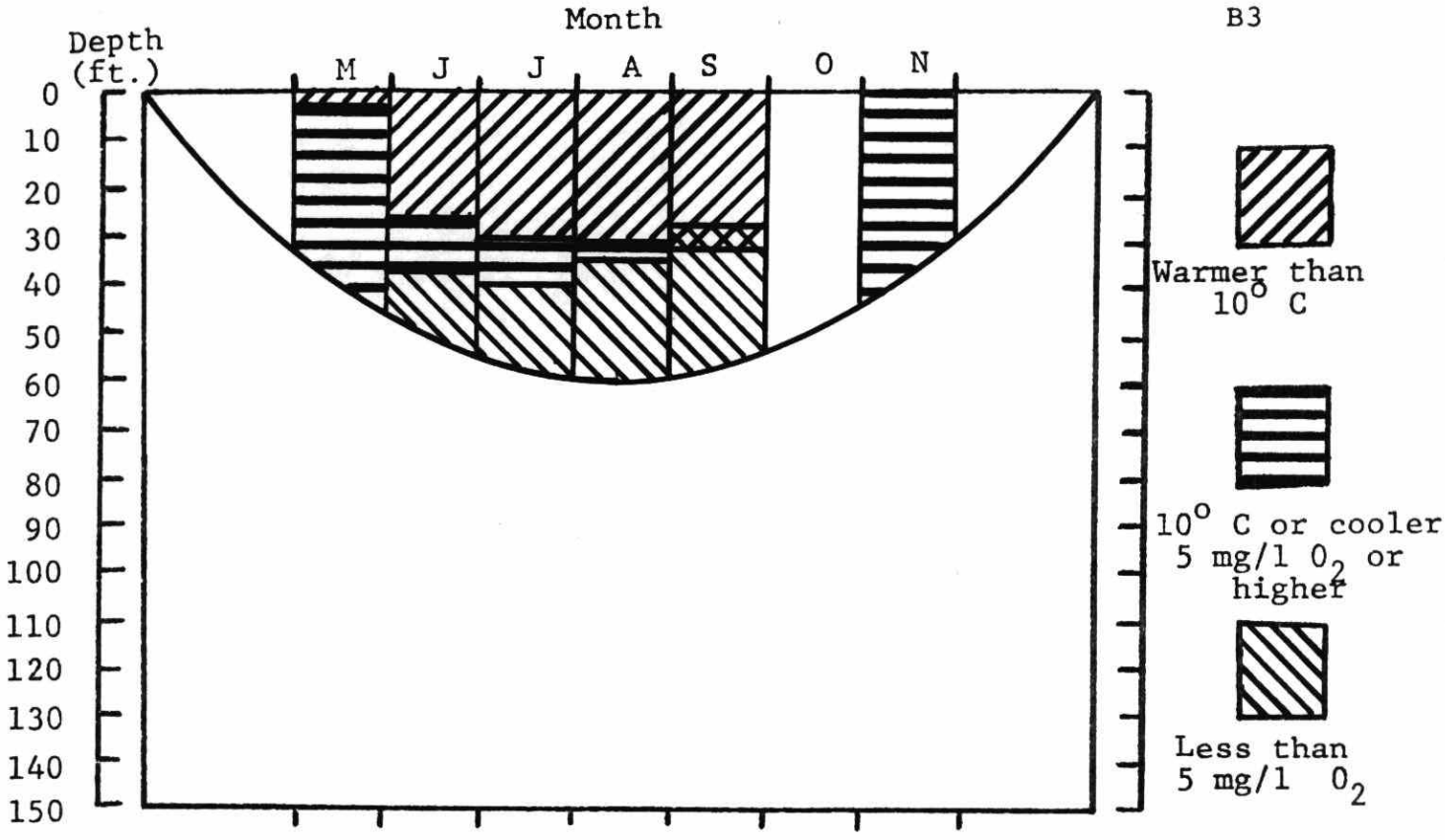
Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	present
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
16	2.5	5	31	56	14	348	L 0.10	7.8

L = less than

Cross (Crotch) Lake reportedly once supported a native and now extinct population of lake trout. The 1976 survey revealed a moderately high level of enrichment at 2.5 ug/l chlorophyll. Unsuitable oxygen and temperature conditions for the lake trout species became evident as early as June.



GRINDSTONE LAKE

Morphometry Hydrology

Surface Area	400	acres
Mean Depth		feet
Maximum Depth	60	feet
Volume		acre-feet
Watershed Area		square miles
Flushing Rate		times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	27
Vacant Lots	0
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	67
% Shoreline Patent	33

Estimated Phosphorus Supply (Annual)

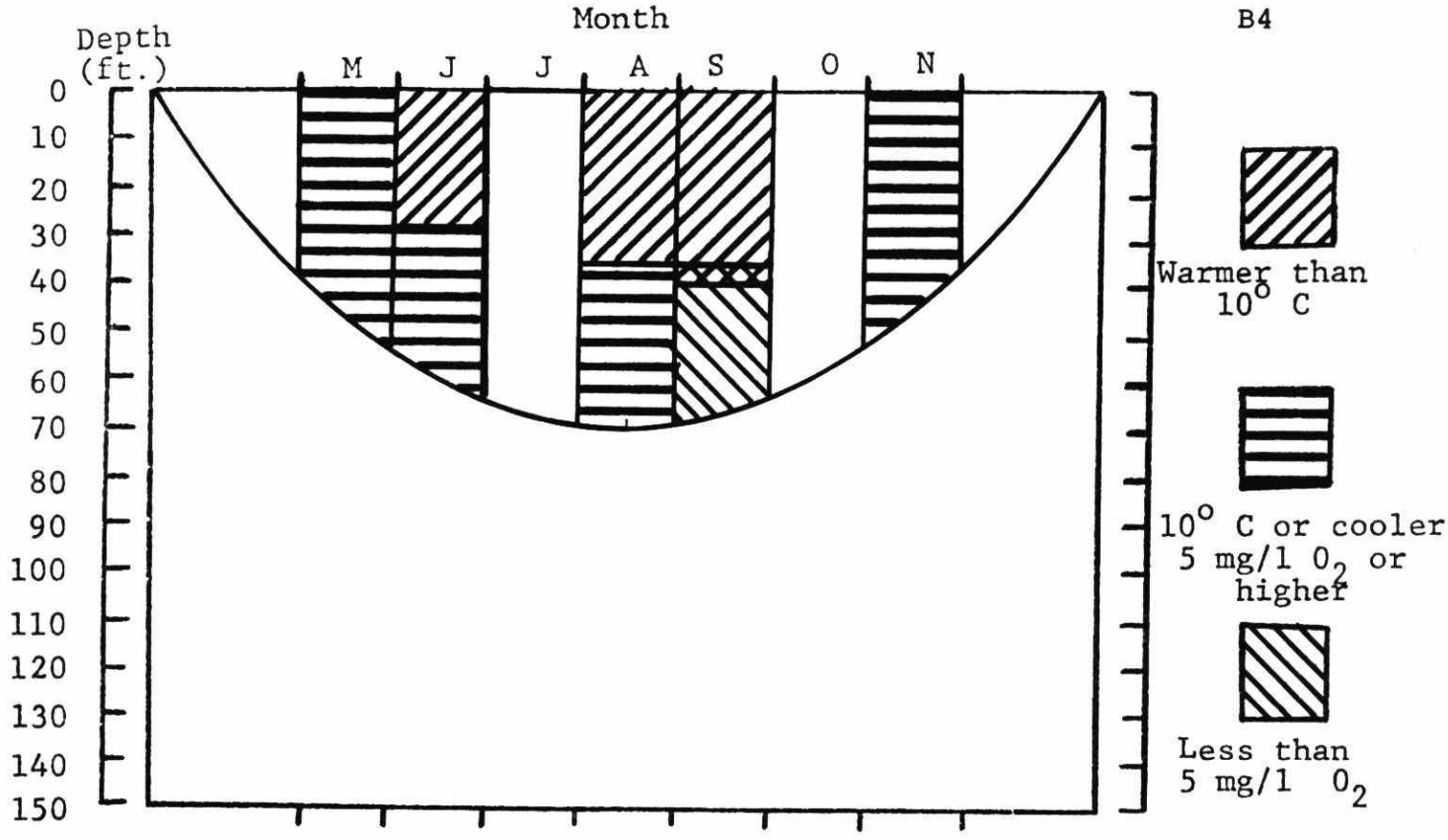
Upstream Lakes	0 lbs.	0%
Land Runoff	59	16
Atmosphere	268	74
Shoreline Develop.	37	10

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
17	2.0	7	35	62	13	354	0.10	7.5

Grindstone Lake reportedly once supported a native population of lake trout. The 1976 survey revealed a moderate level of enrichment at 2.0 ug/l chlorophyll. The oxygen profiles indicate generally poor habitat for lake trout with temperature and oxygen stresses occurring in September. The water quality however was not markedly different from that of Fortune, Mosque, Long Schooner, Grimsthorpe, Hungry, Thanet, Big Clear and Joe Perry which all still support lake trout.



KASHWAKAMAK LAKE

Morphometry Hydrology

Surface Area	2,943	acres
Mean Depth	31	feet
Maximum Depth	72	feet
Volume	78,393	acre-feet
Watershed Area	158.2	square miles
Flushing Rate	1.49	times per yr.
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	445
Vacant Lots	58
Tourist Camps	0
Tent, Trailer Sites	76
% Shoreline Crown	50
% Shoreline Patent	50

Estimated Phosphorus Supply (Annual)

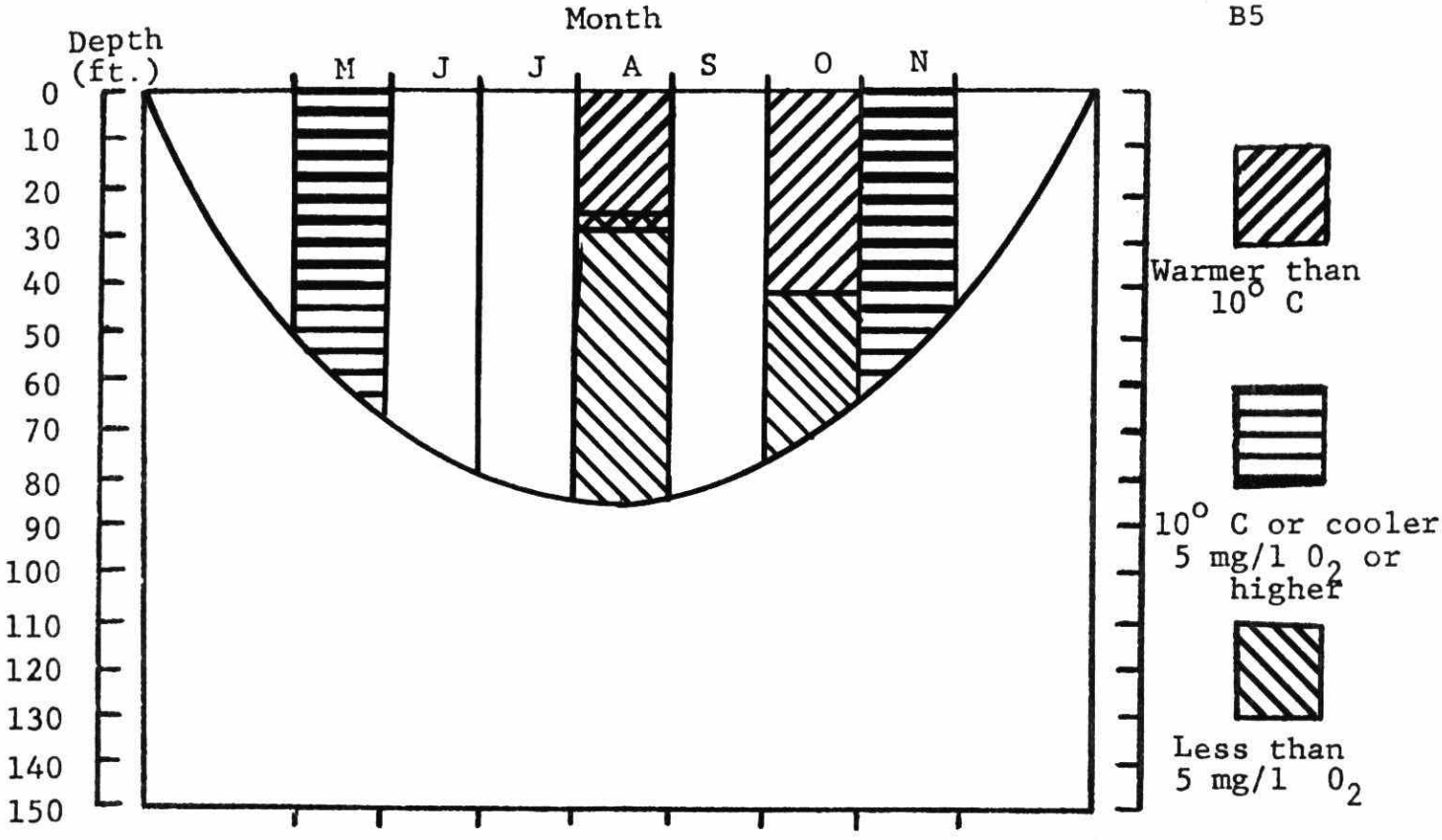
Upstream Lakes	2,694	lbs.	46%
Land Runoff	556		9
Atmosphere	1,970		33
Shoreline Develop.	671		12

Indicator Food Organisms

Ponteporeia affinis	present
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
18	1.6	10	39	71	9	339	0.30	6.9

Kashwakamak Lake reportedly once supported a native and now extinct population of lake trout. The 1976 survey revealed a low level of enrichment at 1.6 ug/l chlorophyll. While conditions of oxygen and temperature stress were evident during the September survey, the oxygen profiles suggest marginally suitable water quality for lake trout survival.



LOWER BEVERLY LAKE

Morphometry Hydrology

Surface Area	1,893	acres
Mean Depth	30	feet
Maximum Depth	85	feet
Volume	56,896	acre-feet
Watershed Area	93.4	square miles
Flushing Rate	1.21	times per year
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	200
Vacant Lots	33
Tourist Camps	0
Tent, Trailer Sites	151
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

Upstream Lakes	1,684	lbs.	20%
Land Runoff	4,949		59
Atmosphere	1,268		15
Shoreline Develop.	432		6

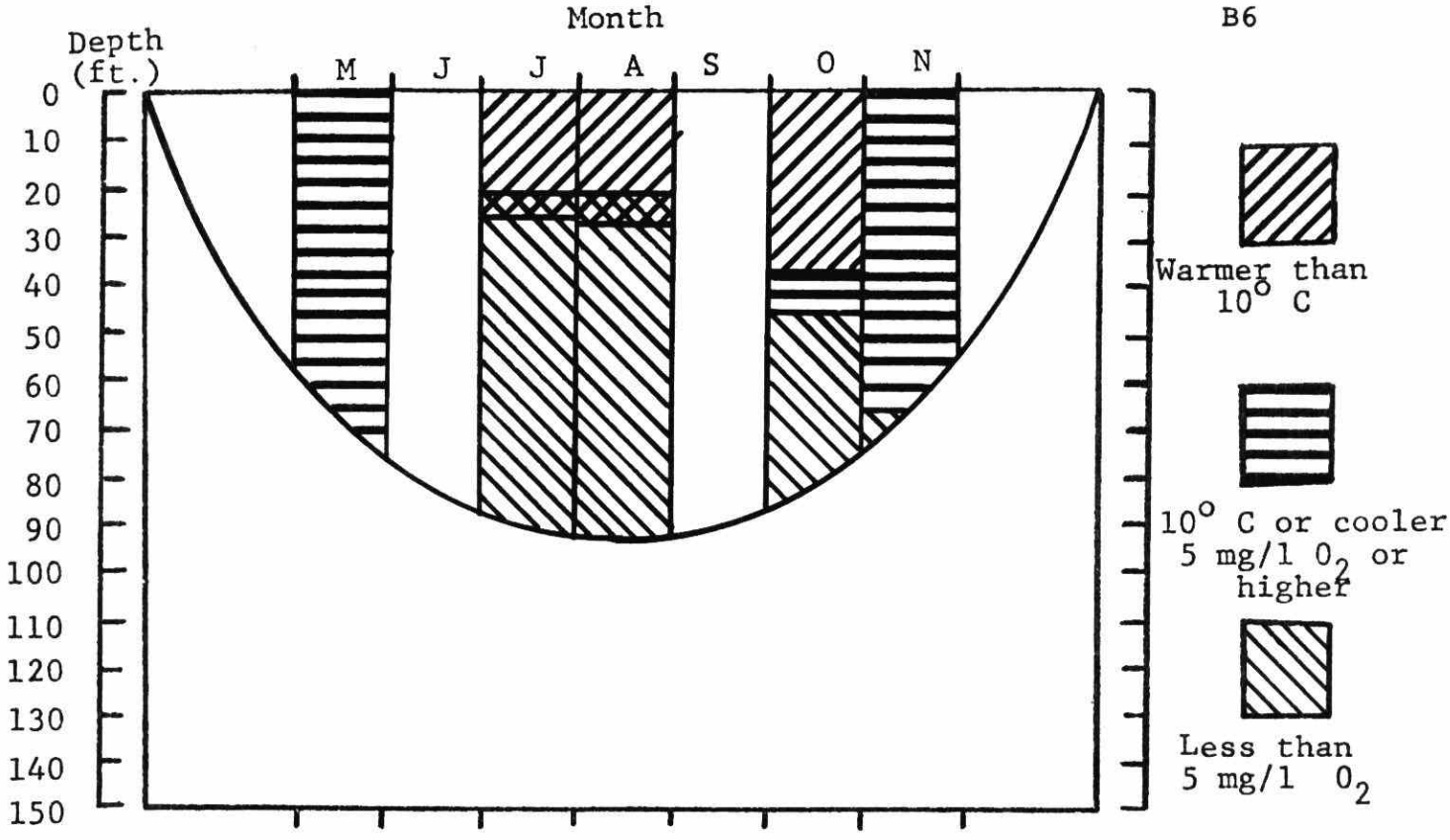
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	not detected

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
11	4.1	13	121	163	29	448	L 0.05	8.5

L = less than

Lower Beverly Lake reportedly once supported a native and now extinct population of lake trout. The 1975 survey revealed a high level of enrichment at 4.1 ug/l chlorophyll and oxygen conditions unsuitable for lake trout survival.



SKOOTAMATTA LAKE

Morphometry Hydrology

Surface Area	1,128	acres
Mean Depth		feet
Maximum Depth	96	feet
Volume		acre-feet
Watershed Area	20.8	square miles
Flushing Rate		times per yr.
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	36
Vacant Lots	
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	90
% Shoreline Patent	10

Estimated Phosphorus Supply (Annual)

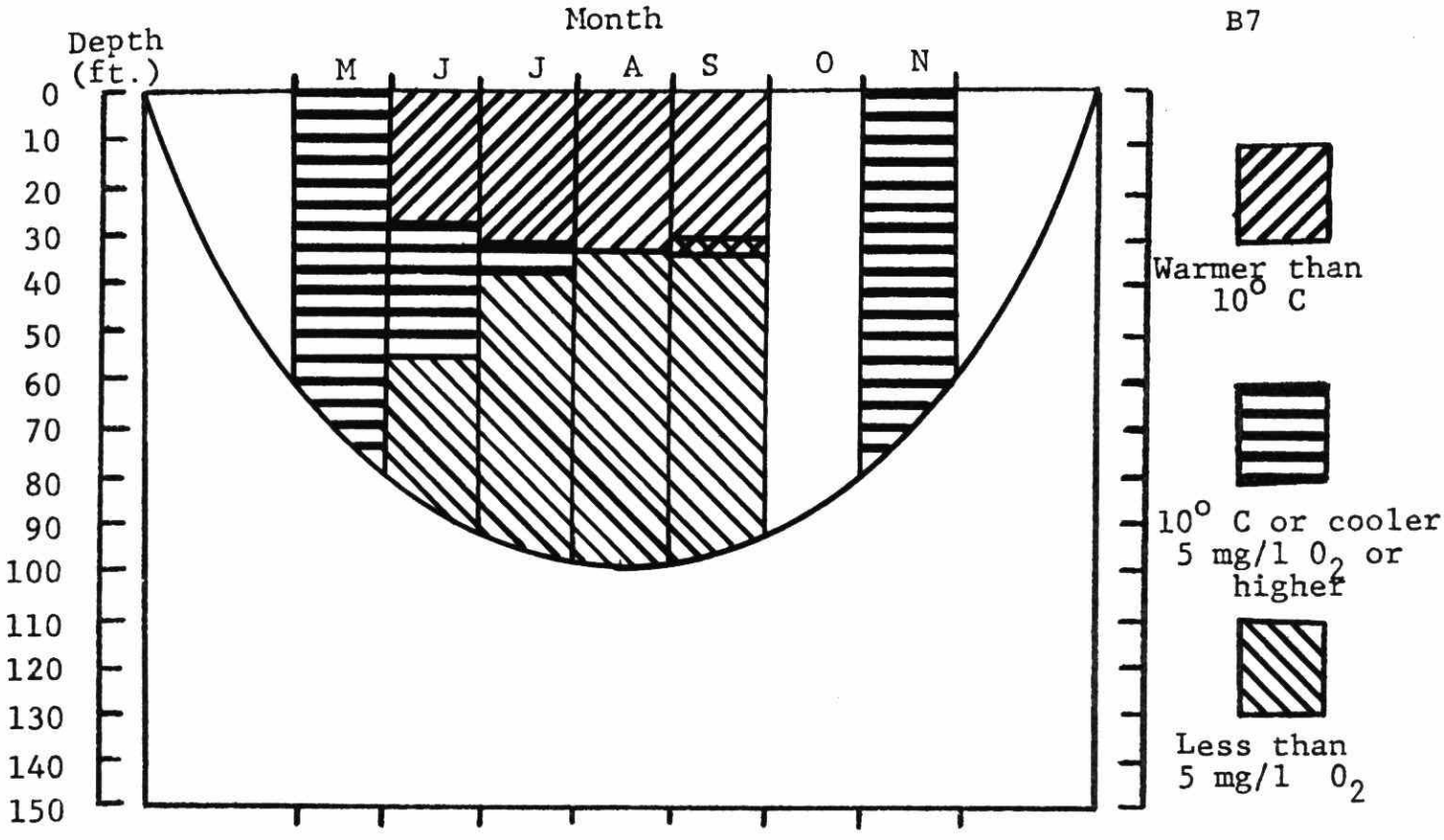
Upstream Lakes	0	lbs.	0%
Land Runoff	1,066		57
Atmosphere	755		40
Shoreline Develop.	49		3

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
12	3.5	15	12	33	21	384	0.10	6.9

Skootamatta Lake reportedly once supported a native and now extinct population of lake trout. The 1975 survey revealed a high level of enrichment at 3.5 ug/l chlorophyll and oxygen conditions unsuitable for lake trout survival.



THIRTY ISLAND LAKE

Morphometry Hydrology

Surface Area	484	acres
Mean Depth	37	feet
Maximum Depth	105	feet
Volume	18,053	acre-feet
Watershed Area	3.2	square miles
Flushing Rate	0.34	times per year
Water Level Fluct.	1.5	feet

Shoreline Development

Cottages, Homes	98
Vacant Lots	65
Tourist Camps	0
Tent, Trailer Sites	0
% Shoreline Crown	4
% Shoreline Patent	96

Estimated Phosphorus Supply (Annual)

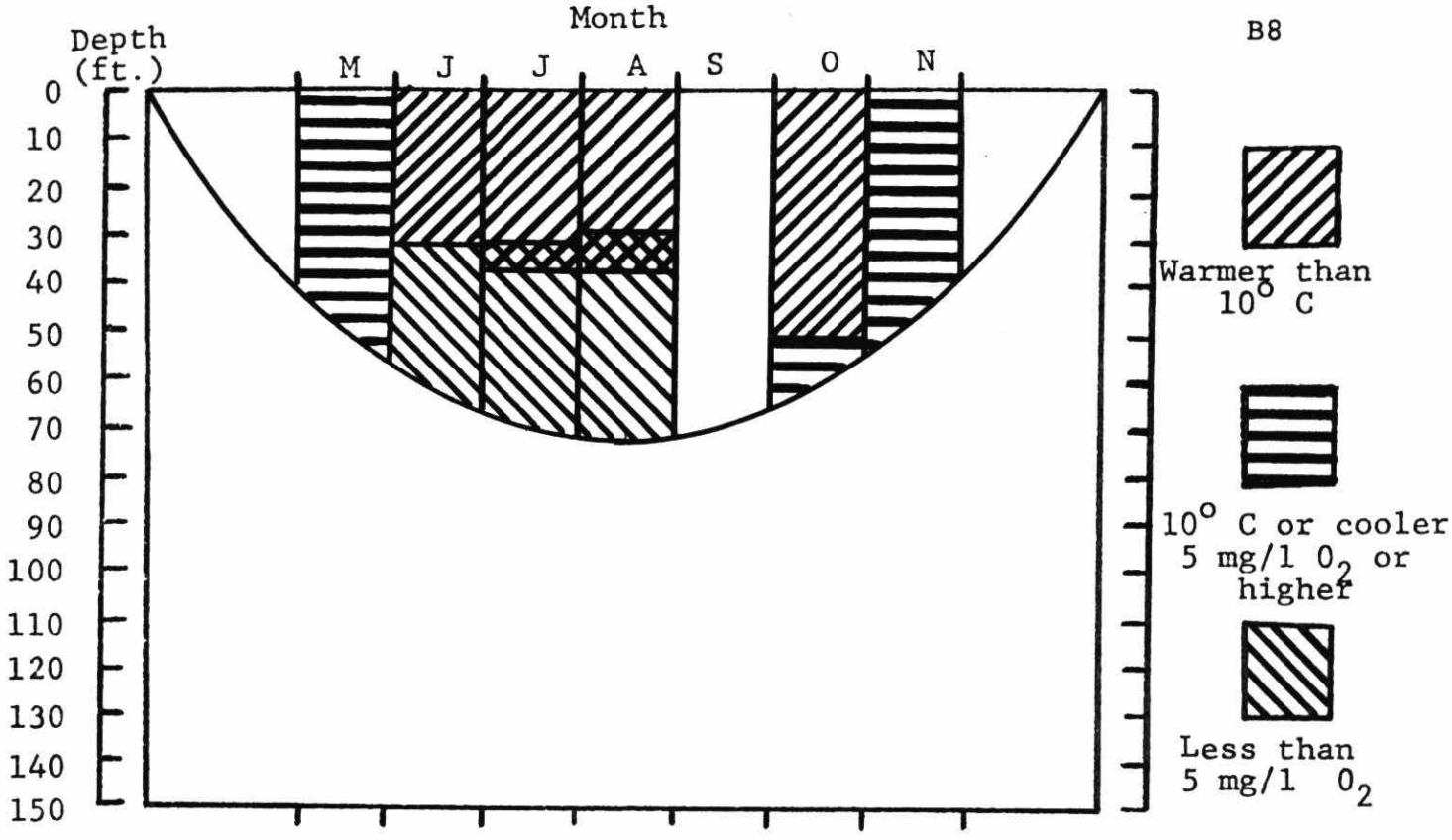
Upstream Lakes	106	lbs.	16%
Land Runoff	136		19
Atmosphere	324		46
Shoreline Develop.	133		19

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
15	2.6	5	69	111	12	394	0.25	7.2

Thirty Island Lake reportedly once supported a population of lake trout which is now considered to be extinct. The 1976 survey revealed a moderately high level of enrichment at 2.6 ug/l chlorophyll. Unsuitable oxygen and temperature conditions for the lake trout species were evident in August and September.



UPPER RIDEAU LAKE

Morphometry Hydrology

Surface Area	3,366	acres
Mean Depth	26	feet
Maximum Depth	72	feet
Volume	88,955	acre-feet
Watershed Area	59.8	square miles
Flushing Rate	0.50	times per yr.
Water Level Fluct.		feet

Shoreline Development

Cottages, Homes	240
Vacant Lots	86
Tourist Camps	53
Tent, Trailer Sites	254
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

Upstream Lakes	884 lbs.	16%
Land Runoff	1,640	30
Atmosphere	2,253	42
Shoreline Develop.	622	12

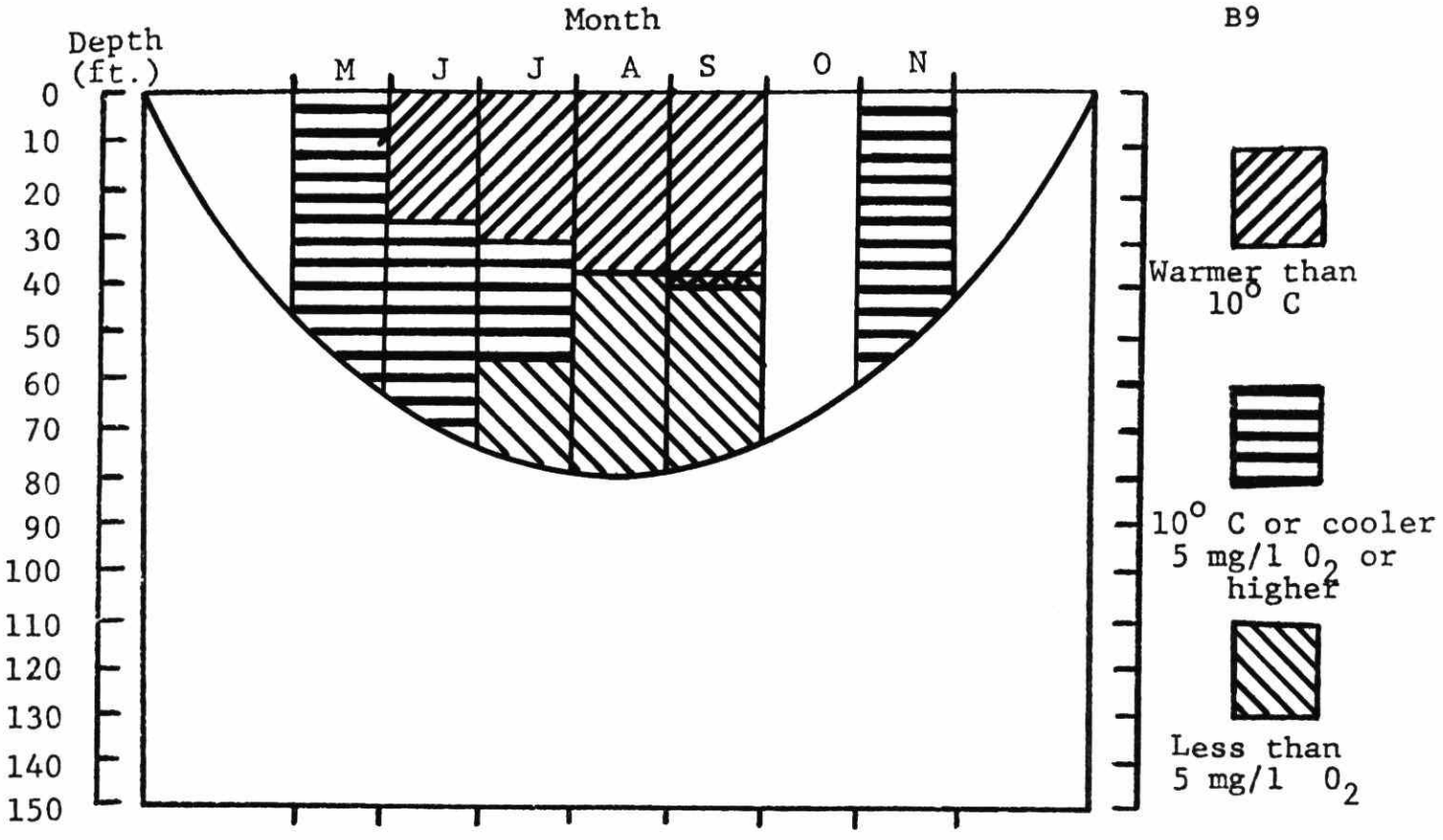
Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
9	9.1	5	93	142	26	523	L 0.12	7.6

L = less than

Upper Rideau Lake reportedly once supported a native population of lake trout. The 1975 survey revealed a very high level of enrichment at 9.1 ug/l chlorophyll. Severe oxygen depletion was detected in June and persisted through to October.



WHITE LAKE

Morphometry Hydrology

Surface Area	457	acres
Mean Depth	28	feet
Maximum Depth	82	feet
Volume	12,524	acre-feet
Watershed Area	3.8	square miles
Flushing Rate	0.21	times per year
Water Level Fluct.	0.0	feet

Shoreline Development

Cottages, Homes	61
Vacant Lots	36
Tourist Camps	0
Tent, Trailer Sites	35
% Shoreline Crown	0
% Shoreline Patent	100

Estimated Phosphorus Supply (Annual)

Upstream Lakes	0	lbs.	0%
Land Runoff	176		29
Atmosphere	306		50
Shoreline Develop.	130		21

Indicator Food Organisms

Ponteporeia affinis	not detected
Mysis relecta	not detected
Lake Herring	present

Secchi ft.	Chlorophyll ug/l	Colour hazen	Alkalinity mg/l	TDS mg/l	Total P ug/l	Total N ug/l	Iron mg/l	pH
9	1.8	5	113	126	11	378	0.18	7.9

White Lake reportedly once supported a native and now extinct population of lake trout. The 1976 survey revealed a moderate level of enrichment at 1.8 ug/l chlorophyll. Unsuitable oxygen and temperature conditions for the lake trout species were evident in August and September.

APPENDIX C

This report has provided the findings of studies carried out on 45 lakes in Southeastern Ontario which are currently being managed by MNR as lake trout fisheries. The report has also included an additional 8 lakes which are considered to have extinct lake trout populations but appear based on findings of the MOE study to have suitable water quality conditions for survival of the lake trout species.

In addition to the abovementioned 53 bodies of water there are a further 15 lakes in Southeastern Ontario which are currently being managed as lake trout fisheries. These lakes have not yet been surveyed by MOE. They are relatively small lakes which were not included in the study since they could not be sampled by aircraft. They include

LAKE	TOWNSHIP
Camp	Miller
Big Clear	Bedford
Big Mair	North Canonto
Big Salmon	Bedford
Fox	Ashby
Garter	Bedford
Green	Clarendon
Kilbourne	Abinger
Little Clear	Bedford
Little Salmon	Bedford
McCausland	Barrie
Murray	Darling
Napier	Darling
Potspoon	Bedford
Simpson	Ashby

Water quality studies will be carried out on these waters prior to December 31, 1982.